DIVISION OF ENVIRONMENT
QUALITY MANAGEMENT PLAN

PART III:

AMBIENT AIR MONITORING
STANDARD OPERATING PROCEDURES

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Section 1

CONTINUOUS GASEOUS MONITORING

I. Overview

This section describes the procedures for operating, calibrating, auditing, and maintaining continuous gaseous analyzers. The following ambient air pollutants are measured by these procedures: carbon monoxide (CO), nitrogen dioxide (NO_2), nitric oxide (NO), oxides of nitrogen (NOx), ozone (O_3), sulfur dioxide (SO_2), and hydrogen sulfide (H_2S).

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

A. Calibration

1. Purpose

A calibration establishes the relationship between actual pollutant concentration input and the response of the instrument. This relationship is used to convert subsequent analyzer response values to corresponding pollutant concentrations until superseded by a later calibration of the analyzer.

2. Principle and Applicability

Calibrations are performed at the monitoring site by allowing the analyzer to sample a gaseous standard containing a known pollutant concentration. During calibration, the analyzer operates in its normal sampling mode, and the gaseous standard must pass through all filters, scrubbers, conditioners, and other components used during routine ambient sampling, and also as much of the ambient air inlet system as practicable. Each analyzer must be calibrated in accordance with its manufacturer's operation manual and the specific guidance herein provided.

The type and quality of gaseous standards used are specified in 40 CFR 58, Appendix A, Section 2, 40 CFR 58, Appendix B, Section 2, and 40 CFR 50, Appendices C, D, and F. (See also AAM SOP Section 10 below, "Certification of Standards".) The calibration includes a zero (0) concentration and at least three (3) upscale concentrations spread approximately equally over the measurement scale range. Additional upscale concentrations may be necessary to establish the calibration relationship for nonlinear analyzers. Multirange analyzers must be calibrated for all ranges likely to be used.

3. Frequency of Calibration

Calibration of an analyzer is performed at the time of installation. Recalibration must be performed no later than six (6) months after the most recent calibration.

Subsequent to any of the following occurrences, the zero and span drift must be checked (see paragraph III.B below, "Continuous Analyzer Zero and Span Check") to determine whether recalibration is necessary: an interruption of analyzer operation lasting more than a few days; repairs which might affect calibration; physical relocation of the analyzer; or any other indication of significant analyzer inaccuracy.

4. Equipment

a. Source of zero-air (cylinder, scrubber, oxidizer)
b. Traceable (see AAM SOP Section 10, "Certification of Standards") calibration standards:
   i. Permeation tube and connecting tubing (for SO_2, NO_2, and H_2S)
   ii. Gas cylinder (for CO (balance air) and NO)
   iii. u.v. standard photometer (for O_3)
c. Regulator valve
d. Tubing and connectors
e. Bypass valve to prevent pressurization of analyzer
f. Flow meter
g. Calibrated dilution equipment

5. Calibration Procedure

a. For proper calibration of any analyzer, avoid pressurization of the system by using a bypass valve and flow meter. Use of a flow meter on the bypass or vented port of certain pressure sensitive monitors will cause erroneous readings. Follow all applicable calibration instructions in the instrument manufacturer's operation manual.

b. Initiate a flow of zero-air gas through the analyzer. Adjust zero in accordance with the analyzer manufacturer's recommended procedures if necessary. Record the resultant instrument reading.

c. Initiate a flow of a known gas between 0.35 PPM and 0.45 PPM (35 PPM to 45 PPM for CO) through the analyzer. If necessary, adjust the monitor in accordance with the analyzer manufacturer's procedures. Record the resultant instrument reading.

d. Initiate a flow of a known gas between 0.15 PPM and 0.20 PPM (15 PPM to 20 PPM for CO) through the analyzer. Record the resultant instrument reading.

e. Initiate a flow of a known gas between 0.03 PPM and 0.08 PPM (3 PPM to 8 PPM for CO) through the analyzer. Record the resultant instrument reading.

6. The operator records the following information in order to document the calibration and submits it to the Bureau QA Representative: type of QC, pollutant, date, time of day, analyzer make and model, analyzer ID number, person doing QC, location or site ID, known gas type (if applicable), known gas name (if applicable), known gas ID number (if applicable), permeation tube ID (if applicable), calibration equipment type (if applicable), calibration equipment name (if applicable), calibration equipment ID number (if applicable), known concentrations, analyzer readings, ambient temperature (if applicable), and ambient barometric pressure, (if applicable).

B. Continuous Analyzer Zero and Span Check

1. Purpose

The zero and span check is actually a two point calibration, but in this document a calibration refers to a four or more point calibration. The zero and span check is employed to verify calibration of a continuous monitoring instrument. Zero and span checks are required and may be used to: provide data to allow analyzer adjustment to correct for zero and span drift; provide decision points for (re)calibration of analyzers; and provide decision points for invalidation of monitoring data.

2. Principle and Applicability

This procedure employs comparing the monitor reading of an artificial test gas zero concentration and an artificial test gas of a pollutant at one (1) upscale concentration between 70% and 90% of the measurement range. The monitoring may be adjusted to read more accurately based on this check.

3. Frequency of Zero and Span Checks

After the normal variability of the analyzer has been established, a zero and span check should be performed at least once every two (2) weeks.

4. Equipment

a. Source of zero-air (cylinder, scrubber, oxidizer)

b. Traceable calibration standards:

Permeation tube and connecting tubing (for SO_2 and H_2S)
Gas cylinder (for CO (balance air) and NO)
u.v. standard photometer (for O_3)

c. Regulator valve

d. Tubing and connectors

e. Bypass valve to prevent pressurization of analyzer

f. Flow meter

g. Calibrated dilution equipment

5. Zero and Span Check Procedure

a. The zero and span check is performed at the monitoring site. The known gas must be certified according to AAM SOP Section 10, "Certification of Standards". When performing this procedure, the operator will comply with the instructions of the manufacturer's operation manual.

b. During this procedure, the analyzer operates in its normal sampling mode, and the gaseous standard must pass through all filters, scrubbers, conditioners, and other components used during routine ambient sampling, and also as much of the ambient air inlet system as practicable.

c. Initiate flow of a zero-air gas through the analyzer. After the monitor reading has stabilized, record the resultant unadjusted zero reading as "unadj zero".

d. The operator may adjust the zero at his/her discretion if the "unadj zero" falls into any of the following ranges:

CO, from -2.5 PPM to 2.5 PPM
Other pollutants, from -0.025 PPM to 0.025 PPM

If an adjustment is made, record the resultant reading.

The operator will perform a multipoint calibration of the monitor if the "unadj zero" falls into any of the following ranges,

CO, less than -2.5 PPM or greater than 2.5 PPM
Other pollutants, less than -0.025 PPM or greater than 0.025 PPM

e. Initiate flow of a known gas between 0.35 PPM and 0.45 PPM (35 PPM to 45 PPM for CO) through the analyzer. Record the known concentration (K) and the resultant monitor reading (R).

f. Calculate and record the percent difference (PD):

$$PD = ((R-K)/K) * 100$$

g. If PD is -15 to +15, the operator may adjust the monitor at his/her discretion. If an adjustment is made, record the resultant reading.

If PD is > 15 or < -15, recalibrate the analyzer.

If PD is > 25 or < -25, invalidate data back to the last valid (span PD from -15 to +15 without adjustment) zero/span check, audit, or calibration. Investigate potential operational problems, and perform necessary maintenance or repairs. Recalibrate the analyzer.

h. All zero and span checks must be documented in a chronological format. Record the following on a span check form: site ID, pollutant, analyzer identification, date, time of day, identification of standards used, name of person conducting the check, identification of other equipment used, unadjusted zero reading, adjusted zero reading (if applicable), known span concentration, unadjusted span reading, and adjusted span reading (if applicable).

C. Troubleshooting

Troubleshooting will be performed according to the manufacturer's operating manual.

IV. Collection of Data Including Operating Procedures

A. Install the monitor following the instructions in the manufacturer's operating manual. Connect the monitor to the data logger following the instructions in the manufacturer's operating manual and the data logger operating manual. The data logger will be set to Central Standard Time throughout the year. Operate the monitor following the instructions in the manufacturer's operating manual.

B. Preventive Maintenance for Continuous Analyzers

1. For all analyzers, preventive maintenance is performed according to the instructions in the analyzer instrument manual provided by the manufacturer. The schedule in the instrument manual is followed. All preventive maintenance actions are recorded.

2. Sampling line filters are inspected/replaced every month.

3. For H_2S analyzers, SO_2 selective scrubbers and H_2S converters are inspected periodically and replaced when necessary.

4. For any preventive or remedial maintenance actions taken, the action is recorded and kept on file. Documentation must include analyzer identification, analyzer location, date of maintenance, name of person who performed maintenance, and type of maintenance performed.

C. Safety Precautions

1. General safety precautions related to electrical hazards must be observed at all times when working with electrical equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electrical equipment in wet conditions, as frequently encountered at field monitoring sites. Electrical equipment should be switched off and disconnected prior to servicing of internal parts. (Note: Some internal adjustments may require the equipment to be switched on.)

2. General safety precautions related to the handling and use of compressed gases must be observed during the calibration and QC procedures for continuous analyzers. Never attempt to use the contents of a compressed gas

cylinder without an appropriate pressure regulator. Do not remove valve protector cap until ready to make connections. Keep valve pointed away from yourself and anyone else. Vent valve briefly to clear opening of dirt and debris before making connection. Never hammer on a cylinder valve or use excessive force in opening or closing. After making connections, check for leaks with soapy water. Close cylinder valve and release all pressure from a device before disconnecting. Never apply oil to a compressed gas valve or regulator. Never expose a compressed gas cylinder to a temperature above 125^{o} F. Vent and use compressed gases only with adequate ventilation.

D. H_2S Monitoring

1. Purpose

This procedure provides guidance for modification of a continuous SO_2 analyzer in order to monitor hydrogen sulfide (H_2S) concentration in ambient air.

2. Principle and Applicability

Hydrogen Sulfide (H_2S) is measured by using an SO_2 analyzer in conjunction with an H_2S converter. The ambient air is routed first to the permeation dryer of the SO_2 analyzer. (In a TECO or Dasibi system, a selective scrubber is utilized for removal of ambient SO_2.) Then the air goes to the H_2S converter, where H_2S is converted to SO_2. The air is then routed to the SO_2 analyzer where the SO_2 is measured. This concentration of SO_2 represents the ambient concentration of H_2S.

3. Equipment

a. Continuous SO_2 analyzer

b. H_2S converter unit

c. Plumbing and fittings

4. Modification of SO_2 Analyzer for Measurement of H_2S

Note: This modification is not necessary if using a Dasibi/CSI system.

a. Route ambient air flow through the permeation dryer of the SO_2 analyzer.

b. Route air flow through the H_2S converter.

c. Route air flow back through the SO_2 analyzer.

d. Set the switch on the H_2S converter to SO_x.

V. Quality Control Sampling.

A. Analyzer Precision Check

1. Purpose

The precision check is performed in order to monitor analyzer performance. Evaluation of precision data, together with accuracy audit data, provides an indication of overall quality of monitoring data.

2. Principle and Applicability

Precision of continuous analyzers is monitored by means of one-point calibration checks at approximately the level of the National Ambient Air Quality Standards (NAAQS) for the appropriate pollutants.

3. Frequency of Precision Checks

Precision checks are performed on the same schedule as zero and span checks, i.e., at least every two (2) weeks.

4. Equipment

a. Source of zero-air (cylinder, scrubber, oxidizer)

b. Traceable calibration standards:

Permeation tube and connecting tubing (for SO_2 and H_2S)
Gas cylinder (for CO (balance air) and NO)
u.v. standard photometer (for O_3)

c. Regulator valve

d. Tubing and connectors

e. Bypass valve to prevent pressurization of analyzer

f. Flow meter

g. Calibrated dilution equipment

5. Precision Check Procedure

a. The precision check is performed at the monitoring site. The known gas must be certified according to AAM SOP Section 10, "Certification of Standards". When performing this procedure, the operator will comply with the instructions of the manufacturer's operation manual.

b. During this procedure, the analyzer operates in its normal sampling mode, and the gaseous standard must pass through all filters, scrubbers, conditioners, and other components used during routine ambient sampling, and also as much of the ambient air inlet system as practicable.

c. Perform the precision check prior to the zero and span check, and prior to adjusting the monitor.

d. Initiate flow of a known gas between 0.08 PPM to 0.10 PPM (8 PPM to 10 PPM for CO) through the analyzer.

e. Record the following: site ID, pollutant, analyzer identification, date, time of day, identification of standards used, name of person conducting the check, identification of other equipment used, known concentration, and monitor reading.

f. Submit the results to the Bureau QA Representative.

B. Continuous Analyzer Audit

1. Purpose

The performance audit is performed in order to verify analyzer performance. Evaluation of audit data, together with precision check data, provides an indication of overall quality of monitoring data.

2. Principle and Applicability

Performance audits employ the following gaseous standards:

zero-air gas
0.03 to 0.08 PPM (3 PPM to 8 PPM for CO)
0.15 to 0.20 PPM (15 PPM to 20 PPM for CO)
0.35 to 0.45 PPM (35 PPM to 45 PPM for CO)

Traceable gases, dilution apparatus, and transfer standards utilized in audits must be different from those employed in other QC procedures. Audit data must fall within 15% of actual values for acceptance.

3. Frequency of Audits

Audits are conducted on a schedule that meets two (2) requirements: each pollutant parameter is audited at least once per calendar quarter, and each analyzer is audited at least once per year.

4. Equipment

a. Use components dedicated to audit procedures whenever possible.

b. Source of zero-air (cylinder, scrubber, oxidizer)

c. Traceable calibration standards (from different sources than those used for other QC operations):
Permeation tube and connecting tubing (for SO_2, NO_2, and H_2S)
Gas cylinder (for CO (balance air))
u.v. standard photometer (for O_3)

d. Regulator valve

e. Tubing and connectors

f. Bypass valve to prevent pressurization of analyzer

g. Flow meter

h. Calibrated dilution equipment

5. Audit Procedure

a. Use a different known gas than is used for other QC operations. Perform the audit prior to adjusting the monitor.

b. The audit is performed at the monitoring site. The known gas must be certified according to AAM SOP Section 10, "Certification of Standards". When performing this procedure, the operator and/or auditor will comply with the instructions of the manufacturer's operation manual.

c. During this procedure, the analyzer operates in its normal sampling mode, and the gaseous standard must pass through all filters, scrubbers, conditioners, and other components used during routine ambient sampling, and also as much of the ambient air inlet system as practicable.

d. Pass the following concentrations of known gas through the analyzer:

zero-air gas
0.03 to 0.08 PPM (3 PPM to 8 PPM for CO)
0.15 to 0.20 PPM (15 PPM to 20 PPM for CO)
0.35 to 0.45 PPM (35 PPM to 45 PPM for CO)

e. Record the following: site ID, pollutant, analyzer identification, date, time of day, identification of standards used, name of person conducting the audit, identification of other equipment used, known concentrations, and monitor readings.

f. Submit the results to the Bureau QA Representative.

C. Special Guidance for Episode Monitoring

1. This procedure is intended to provide special guidance for additional QC requirements during air pollution episode monitoring.

2. As defined here, for the purpose of QC, an air pollution episode is any measured ambient air concentration equal to or greater than a Air Quality Index (AQI) of 200. Pollutant concentrations corresponding to a AQI of 200 appear in Tables 1 and 2 of 40 CFR 58, Appendix G and below.

Pollutant	Averaging time	Concentration in PPM for AQI of 200
SO2	24 hours	0.300
CO	8 hours	15
Ozone	1 hour	0.200
NO2	1 hour	0.600

3. In addition to all other guidance in this document, the following additional procedures are required for analyzers used for monitoring during air pollution episodes:

   a. Continuous analyzer zero and span checks (paragraph III.B above) will be performed at least weekly, provided the episode lasts longer than one week.

   b. A precision check (paragraph V.A above) will be performed immediately prior to each zero and span check.

   c. Subsequent to an episode, as soon as possible, each analyzer used for monitoring of the episode shall be subjected to a performance audit (paragraph V.B above).

VI. Preparation and Analyzing Samples in the Field

Procedures for this are given in paragraph IV above.

VII. Transporting, Transferring, and Storing Samples

Pollutant concentration data is automatically transported electronically over the phone line to a central office computer. Records of field activities (calibrations, preventive maintenance actions, precision checks, zero and span checks, and audits) are initialed and mailed or hand carried to the Bureau QA Representative. Further details can be found in the AAM SOP Sections 3 and 4 below.

VIII. Data Acquisition and Processing

These activities are described in section three and four of this document (AAM SOP).

IX. Glossary of Technical Terms

See the glossary in Appendix A of the KDHE DOE Quality Management Plan (Part I) and Appendix A of this document, AAM SOP.

X. Checklist of Field Equipment

A. For calibration equipment, see paragraph III.A.4 above.

B. For zero and span equipment, see paragraph III.B.4 above.

C. For H2S equipment, see paragraph IV.D.3 above.

D. For precision check equipment, see paragraph V.A.4 above.

E. For audit equipment, see paragraph V.B.4 above.

Section 2

INTERMITTENT MONITORING WITH HIGH VOLUME SAMPLERS

I. Overview

Pre-weighed Filters are exposed to an air flow (approximately 40 cubic feet per minute (CFM)) for a single 24 hour period (from midnight to midnight (CST)) for the gravimetric determination of total suspended particulate (TSP) and particulate matter less than ten (10) microns in diameter (PM_{10}). This sampling is carried out according to a fixed schedule (once every three (3) or six (6) days) established on an annual basis (USEPA sampling schedule). After exposure, the filters are weighed in a laboratory to determine the net weight gain. The net weight gain and the measured flow rate are used to determine the TSP or PM_{10} concentration in the air.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

A. Purpose

This procedure is employed in order to calibrate HiVol sampler air flow. Orifice calibration units utilized for this procedure are certified by calibration against a positive displacement meter (See Paragraph III.C of Section 10 of AAM SOP).

B. Principle and Applicability

Calibration is performed at the monitoring site. After calibration using a certified calibrator, the air flow is adjusted to approximate a standard flow (QS) setpoint. The QS setpoint for each site location is listed on the calibration form. The QS setpoint corresponds to a field or actual flow of 40 CFM (PM_{10}) and 44 CFM (TSP) based on the annual average pressure and temperature at the site. The list of QS setpoints is shown in paragraph III.E.4 below.

C. Frequency of Calibration

Each HiVol sampler (TSP or PM_{10}) flow measuring device is to be calibrated with a certified orifice calibration unit:

1. Upon receipt;

2. At six (6) month intervals, if not more frequently;

3. After motor maintenance (excluding routine replacement of brushes); and

4. Any time the flow rate device is repaired or replaced.

D. Equipment

1. Certified HiVol orifice calibration unit

2. HiVol sampler

3. Thermometer

4. Barometer

E. Calibration Procedure

1. This procedure is done initially and every six months after that. Perform this procedure on site. On the PM_{10}/TSP Calibration/Audit form, circle calibration, record site ID, type (for example, PM_{10} or TSP), date, person doing the calibration, HiVol motor ID, orifice ID, barometric pressure (P) in millimeters of Mercury (Hg), temperature in degrees Celsius,
T = degrees C + 273,
F = (P/760) * (298/T).

2. Connect the orifice calibrator to the inlet of the sampler. Perform a leak check by plugging up the orifice holes and running the motor. This check will detect fairly large air leaks, but small leaks will go undetected.

3. Install a filter and run the motor for five minutes.

4. Adjust the flow to get four (4) different flow rates for a sampler with a transducer. The standard flow (QS) setpoint should fall between the high and low flow rates chosen. The QS setpoint for each site location is listed on the calibration form. The QS setpoint corresponds to a field or actual flow of 40 CFM (PM_{10}) and 44 CFM (TSP) based on the annual average pressure and temperature at the site. The QS setpoints in CFM are shown below:

Location	PM10	TSP

Goodland	36.8	40.5
Concordia	39.7	43.7
Dodge City	38.0	41.8
Chanute	40.3	44.3
Wichita	39.7	43.7
Topeka	40.6	44.7
Kansas City	40.5	44.6
Hays	39.0	42.9

5. At each flow, read and record the orifice manometer reading (H) in inches.

6. At each flow, calculate Y = H *F and record Y.

7. At each flow, using the orifice calibration curve and Y, determine QS. Record QS.

8. At each flow, read and record the transducer reading (I).

9. Create a calibration curve of I versus QS.

10. Remove the orifice calibration unit.

11. For PM_{10}, adjust the flow so that QS is equal to the QS setpoint (paragraph III.E.4 above) in the table on the calibration form. For TSP, adjust the flow so that QS is in the range from the QS setpoint to six CFM more than the QS setpoint.

12. Record QS and I.

F. Troubleshooting

Follow the procedure in paragraph IV.F.3 below.

IV. Collection of Data Including Operating Procedures

A. Safety note: General safety precautions related to electrical hazards must be observed at all times when working with electrical equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electrical equipment in wet conditions, as frequently encountered at field monitoring sites. Electrical equipment should be switched off and disconnected prior to servicing of internal parts.

B. Purpose

This is a generic procedure for routine operation of a high volume (HiVol) air sampler. Specific manufacturer's instructions and recommendations contained in the appropriate operation manual(s) must also be followed.

C. Principle and Applicability

A HiVol air sampler equipped with a mass-flow controller is utilized to collect 24 hour particulate samples (i.e., TSP: Total Suspended Particulate, or PM_{10}: Particulate Matter $\leq$ ten (10) microns in diameter) by drawing air through a quartz (or glass) fiber filter. All HiVol particulate samples are collected on quartz filters.

D. Frequency

Particulate sampling is generally conducted every sixth day, according to a pre-determined sampling schedule. Operation is under the control of an electronic timing device which is set for an operating period of midnight to midnight (CST) on the appropriate day.

E. Equipment

1. HiVol sampler
2. Filter element(s), quartz (or glass)
3. Filter element envelope(s)
4. Transducer chart (if needed)
5. Pen

F. HiVol Operation

1. Removal of Exposed Filter Element

   a. Open timer door and move switch to the "on" position.

   b. Verify that the Hivol motor and transducer are working properly, remove the transducer chart and place in the filter envelope, and install a new chart on the transducer.

c. Move the power switch to the "Off" position and record the elapsed timer reading on the appropriate envelope.

d. Remove filter cassette from the sampler and disassemble, folding the filter with the exposed side toward itself and place in the appropriate envelope.

e. Sign or initial the envelope.

2. Installation of New Filter Element

a. Place a new filter in the filter cassette with the identification number toward the support screen. Assemble the cassette (this may be completed prior to visiting the site).

b. Record the site number, filter identification number, the sample date, and the "Start" elapsed time on the filter envelope.

c. Install the filter cassette on the sampler and secure.

d. Verify the timer is set for the correct sample period. Mechanical six or seven day timers may be advanced to the correct time (CST) and/or date by rotating the timer wheel. Consult the operator's manual to reset an electronic timer.

e. Notes: Flow adjustment is made during calibration. Do NOT try to readjust. Handle filters with care! Torn filters, or filters with pieces missing cannot be analyzed.

Be sure to record ALL required data on the appropriate envelope.

Samplers must run between 23 and 25 hours. Contact your supervisor if samplers run outside these limits, or if malfunctions are encountered.

3. Preventive Maintenance and Troubleshooting

a. For all analyzers, preventive maintenance and troubleshooting are performed according to the instructions in the analyzer instrument manual provided by the manufacturer. The schedule in the instrument manual is followed. All preventive maintenance actions are recorded.

b. For TSP and PM_{10} samplers, inspect the unit (brushes, motor, housing, and transducer) at six (6) month intervals. As a minimum replace the brushes. Run the motor at reduced voltage for one-half hour subsequent to replacement of brushes to allow them to seat properly. Replace other components if needed or desired. Perform a multipoint calibration.

c. For PM_{10} monitors, disassemble the size-selective inlet (SSI) for access to all impaction areas. Clean thoroughly, and apply oil to the shim at six (6) month intervals. Check all SSI gaskets and cassette gaskets at six (6) month intervals.

d. For any preventive maintenance actions taken, the action is recorded and kept on file. Documentation must include analyzer identification, analyzer location, date of maintenance, name of person who performed maintenance, and type of maintenance performed.

4. Inspection and Voiding of Exposed HiVol Filters

a. Quartz (or glass) HiVol filter elements must be inspected prior to analysis to determine whether all required sample information has been included; and to evaluate the physical condition of each filter to determine suitability for analysis.

b. Reasons to Void Filters

i. Filter torn before or during sampling.
ii. Part of filter missing or hole in filter.
iii. Sampler ran for less than 23 hours or more than 25 hours.
iv. Site unknown.
v. Date unknown.
vi. Flow rate unknown.
vii. Elapsed time unknown.
viii. Tare weight unknown.
ix. More than one filter for the same site and date.
x. Unusual contamination (e.g., bird droppings).
xi. Did not run.
xii. Improper handling of filter or filter improperly installed on sampler.

V. Quality Control Sampling

A. TSP/PM_{10} Precision

1. TSP Precision

Having TSP sites collocated is optional. At each of these collocated sites, one of the samplers is designated duplicate and the other is 'regular'. Each duplicate sampler is to be located more than two (2), but less than four (4) meters away from the regular sampler. At each site the duplicate sampler operates during the same period as the regular sampler.

The results from each sampler are reported to USEPA's AIRS with the other precision and accuracy data.

2. PM_{10} Precision

Precision is provided by having two (2) sites with collocated PM_{10} HiVols. Even if the official PM_{10} sampler operates more than one in six days, the duplicate sampler operates one in six days.

The collocated samplers are from 2 to 4 meters apart. On the days of collocated operation, each sampler will start and stop at the same time. The collocated samplers will be sited and operated according to 40 CFR 58 Appendix A, Section 3.3.

The resulting concentrations from each collocated sampler are reported to EPA AIRS.

B. TSP/PM_{10} Audit

1. Purpose

HiVol sampler flow audits are performed to monitor accuracy of air flow data.

2. Principle and Applicability

a. TSP Audit

TSP accuracy audits are performed by directing air flow into the sampler being audited through a certified orifice calibration unit and recording the resultant flow reading. The orifice calibration unit used for the audit is different than that used in normal calibrations. The orifice calibration unit has been certified using the Roots meter at the EPA Region VII lab.

b. PM_{10} Audit

PM_{10} accuracy audits are performed by directing air flow into the sampler being audited through a certified orifice calibration unit and recording the resultant flow reading. The orifice calibration unit used for the audit is different than that used in normal calibrations. The orifice calibration unit has been certified using the Roots meter at the EPA Region VII lab.

3. Frequency of Audit

a. TSP Audit Frequency

Each TSP HiVol is audited at least once a year. The result of each audit is reported to EPA AIRS.

b. PM_{10} Audit Frequency

Each PM_{10} HiVol is audited at least once a year. Approximately 25 percent of the PM_{10} HiVols are audited each quarter. The result of each audit is reported to EPA AIRS.

4. Equipment

a. Certified HiVol orifice calibration device
b. HiVol sampler
c. Barometer
d. Thermometer

5. TSP/PM_{10} Audit Procedure

a. Use a different orifice calibrator than is used for routine calibration.

b. On the PM_{10}/TSP Calibration/Audit form, circle audit, record the site ID, the type (for example, PM_{10}, TSP, or PM_{10}A), the date, the person doing the audit, the orifice ID, the barometric pressure (P) in millimeters of Mercury (Hg), the temperature in degrees Celsius, T = degrees C + 273.
$F = (P/760) *(298/T)$.

c. Connect the orifice calibrator to the inlet of the sampler. Perform a leak check by plugging up the orifice holes and running the motor.

d. Install a filter and run the HiVol in normal sampling mode for five minutes.

e. Read and record the orifice manometer reading in inches (H).

f. Calculate Y = H * F. Record Y.

g. Using the orifice calibration curve and Y, determine QS. Record QS.

h. Read and record the HiVol reading (I).

i. Using the HiVol calibration curve and I, determine the HiVol QS (HQS). Record HQS.

j. For PM_{10}, if the QS is not within 2 CFM of the QS setpoint, then take corrective action. For TSP, if the QS is not within the QS setpoint minus 2 CFM and the QS setpoint plus 8 CFM, then take corrective action. Record any corrective action.

VI. Preparation and Analyzing Samples in the Field

See paragraph IV above.

VII. Transporting, Transferring, and Storing Samples

Filters are collected in the field following the procedure in paragraph IV above. The operator puts the filter into a custody envelope and the following are recorded on the custody envelope: site ID, date of run, elapsed time of run (and/or start and stop time), average flow rate (and/or the transducer chart is enclosed), and signed initials. The custody envelope (with the filter) is hand carried or mailed to KDHE BAR. Technicians in the Air Monitoring Services Section check the envelope for the correct documentation. They also check the filter to see that is not torn. Then the filters are sent to the KHEL for analysis. After analysis, the filters are sent back to the AMSS for storage for at least one year.

VIII. Data Acquisition and Processing

See paragraph D of section 4 of this document (AAM SOP).

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

See paragraphs III.D, IV.E, and V.B.4 above.

Section 3

POLLING OF CONTINUOUS DATA

I. Overview

This section describes the procedures used by monitoring personnel to transfer continuous monitoring data to the central office computer. The Environmental Systems Corporation's (ESC's) ambient air quality data acquisition software (E-DAS Ambient for Windows), on the central office computer, polls the data loggers and stores the data on a database. E-DAS also provides the capability to make several types of reports of the data.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

Calibration is not applicable. Troubleshooting will be performed according to the instructions in chapter 19 of the User's Guide and Reference Manual (UGRM) for Environmental Systems Corporation's (ESC's) ambient air quality data acquisition software (E-DAS Ambient for Windows).

IV. Collection of Data Including Operating Procedures

A. Initial Setup

The time used (computer and otherwise) will be CST throughout the year. Connect the modem to the office computer and to the telephone line. Install the ESC software following the instructions provided by ESC. Log in to the E-DAS and follow the instructions in chapter 2 of the UGRM. Configure the E-DAS system according to instructions in chapter 3 of the UGRM. Configure the security system of E-DAS according to the instructions in chapter 4 of the UGRM. Configure the site information of E-DAS according to the instructions in chapter 5 of the UGRM. Configure the instrument information of E-DAS according to the instructions in chapter 6 of the UGRM. Note that site and instrument may be copied following the instructions in chapter 7 of the UGRM. Enter the EPA data codes according to the instructions in chapter 10 of the UGRM. Download the configuration information to the data loggers according to the instructions in chapter 11. Configure the E-DAS for automatic polling following the instructions in chapter 12 of the UGRM.

B. Operation

1. Reports and Graphs

The following reports are available on E-DAS: data reports, status reports, hourly summary reports, daily summary reports, monthly reports, flag reports, data recovery reports, network configuration reports, calibration reports, Air Quality Index (AQI) reports, violation of standards reports, joint frequency distribution reports, meteorological reports, maximum hourly averages reports, frequency reports, and non-continuous reports. A detailed description of these reports is in chapter 13 of the UGRM. A detailed description of the graphs available is in chapter 15 of the UGRM.

2. Editing Data

When changing data on E-DAS, follow the instructions in chapter 14 of the UGRM. To invalidate data, change the status flag to I. Since the Bureau Quality Assurance Representative (BQAR) maintains a parallel E-DAS on his/her computer, only the BQAR will change data on either E-DAS. If other personnel need data changes to the E-DAS, they will notify the BQAR of the changes.

3. EPA AIRS Data

In order to transmit data from one E-DAS to another or to transmit data to/from EPA, data is exported/imported in AIRS format. Chapter 16 of the UGRM is followed in order to export/import AIRS format data.

V. Quality Control Sampling

None will be done since this SOP does not involve sampling.

VI. Preparation and Analyzing Samples in the Field

This is not applicable because no sampling is performed in this procedure.

VII. Transport, Transferring, and Storing Samples

Further explanations are in paragraph IV above. Regular backups of the data are made on CD.

VIII. Data Acquisition and Processing

This is explained in paragraph IV above and section 4 below.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

Computer, modem, and E-DAS software.

Section 4

DATA MANAGEMENT

I. Overview

This section describes the procedures used by personnel in the office to process the data that come from the field. These procedures can be divided into PM2.5 intermittent data, hourly data, quality control (QC) data, PM10/TSP intermittent data, submitting data to AIRS, submitting site and monitor information to AIRS, calculating local conditions data, and documentation of changes to AIRS. This section does not include data polling because it is covered in section three of the AAM SOP.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

This is not applicable because monitors are not used in this section.

IV. Collection of Data Including Operating Procedures

A. PM2.5 Filter Monitoring

1. Field technicians E-mail the downloaded filter and interval to KDHE Air Monitoring Services Section. A data person detaches the downloaded filter and interval data onto the hard drive. The filter file names begin with SSSSSf01 (SSSSS is the sampler number) and end with .txt or .wpd. Examples would be: 20179f01jun16,99.txt and 20432f01.wpd. The interval file names begin with SSSSSi01 and end with .txt or .wpd. Examples would be: 20432i01jul14.txt and 20620i01.wpd. (The .wpd suffix is used because some systems will not E-mail the .txt files.) The .wpd files are copied into the database computer with .txt extensions. Each sampler has a folder in the folder pm25data. There is also a 'raw' folder in each sampler folder. Here is an example of a 2 sampler network (folders are *italicized*):
pm25data
  20432
    20432f01.txt
    20432i01.txt
    raw

20432f01.txt
20432f02.txt
20432i01.txt
20432i02.txt

20198

20198f01.txt
20198i01.txt

raw

20198f01.txt
20198f02.txt
20198i01.txt
20198i02.txt

Detach the incoming file into the appropriate raw directory. Using Windows EXPLORER, change its name so that it is in the form SSSSSfNN.txt so that it has one higher number (NN) than the current highest number. For example if the incoming file was 20198f01jun23.wpd, then put it in the raw folder under folder 20198 and rename it (for the case above) 20198f03.txt. The maximum number (NN) allowed is 20. All files must end in .txt.

2. Note that raw folders contain up to 20 filter files and 20 interval files. The main sampler folder for each sampler contains only one filter file and one interval file. Monthly, the raw folders will be added on to the main sampler folders by the procedure below.

3. For each file added to the raw folders, using Windows EXPLORER, double click on the filename. This opens up NOTEPAD used to view and/or edit the file. For filter files, check that the elapsed time is around 24:00, the average flow is around 16.7, the AIRS ID and sampler number are correct, the status flags are 00000000 (except blanks are 00800000), and the minutes of elapsed time are around 1440. View the previous filter and interval files to see if there is any missing data in the files. If there are missing data, contact the operator to see why.

4. At least once a month, do an edit check on the filter files in the raw folders in the following manner. Enter the QuickBasic environment. From the folder pm25data, load the program ALFILTER.BAS. Run it. When prompted, choose raw folders. When prompted, choose not to build AIRS records. When prompted, choose not to print data on screen. When prompted, choose to put edit results in a print file. When prompted, choose to print the filter IDs in separate file (.csv). After the program runs, view the print file. Errors are indicated by three asterisks at the beginning of a line. Field blanks are not errors. You can tell field blanks by the status code of ‘00800000' or ‘00900000' (where the zeros may be other numbers). Fix any

site errors by following step 6 below. Maximum temperature difference errors can be ignored because these will be flagged using interval data. After fixing any errors, run again until you get a clean run.

5. In order to check for duplicate filter IDs do the following. Run Quattro Pro. Open the filter ID file (.csv) built while running ALFILTER.BAS above. Sort by filter ID (column B). In cell E1, type @if(b1=b2,99999,0). With cursor at cell E1, click <edit> and <copy>. Select cells E2 to the next-to-last cell occupied in column E. Click <edit> and <paste>. Check for any 99999 in column E. If there are none, then there are no duplicate filter IDs. If there are 99999s, then they mark the duplicate filter IDs. Contact the operator in order to correct these errors.

6. If there are any site errors, fix them in this manner. From the print file of the ALFILTER.BAS run, note any files with site errors. Enter the QuickBasic environment. Load and run EDITSITE.BAS. When prompted, enter the sampler ID of the filter file you want fixed. When prompted whether you want the raw folder, put Y or N. The program will leave the existing file as is and build the corrected file with the name beginning with XX and ending with the last 3 digits of the sampler number plus fNN.txt. For example, say you are fixing file 20238f03.txt, the new file name will be XX238f03.txt. After the program has run, exit QuickBasic. Using Windows EXPLORER, double click on the new file name (e.g., XX238f03.txt). Verify that the site information was fixed. Delete the original file (e.g., 20238f03.txt) and rename the new file (XX238f03.txt) with the original file name (e.g., 20238f03.txt).

7. At least once a month, concatenate (add) the raw data files to the sampler folder data files. From the QuickBasic environment, run COMBINE.BAS. When prompted, key in F. We are doing the filter files first. After the program runs, spot check a few filter files to verify that the last month got added to the sampler filter file. Run COMBINE.BAS again. When prompted, key in I. This time we are doing the interval files. After the program runs, spot check a few interval files to verify that the last month got added to the sampler interval file. The program COMBINE.BAS leaves a temporary file in each of the raw folders named tempcomb.txt. These should be deleted and can be deleted by running a DOS program DELCOMB.BAT. Do this by running Windows EXPLORER. Double click on \pm25data\delcomb.bat. Now since all of the files in the raw folders have been put into the sampler folders, all of the filter and interval files in the raw folders should be deleted. Do this using Windows EXPLORER.

8. When a complete month of filter data has been put into the sampler folders

(not the raw folders), submit the latest month's filter data to IML in this manner. Repeat steps 4-6 above, but do not choose raw folders. Enter the QuickBasic environment. Load and run PICKIML.BAS. When prompted, enter the 2 digit month that you are submitting. After the program runs, scan the resulting file for any obvious errors. E-mail the file to IML at address scotte@imlinc.com with cc: Scott Weir/kdhe. In the E-mail, give any explanation for missing data or other discrepancies in the data.

9. After a month's data have been received from IML (by E-mail), process the Excel spreadsheet data. Detach the zipped file sent by IML into the folder \pm25data\iml\YYYY-Qq (for example 1999-2q). Unzip the file. In Quattro Pro, open the spreadsheets (.xls) and then save them into folder \pm25data\iml\YYYY-Qq (for example 1999-2q) in Quattro Pro format (.wb3). E-mail the .wb3 files to all operators and KDHE Air Monitoring Services Section staff.

10. After a quarter's data (finalized) have been received from IML (by E-mail), process the AIRS text files. These files, KSprimary.txt and KSduplicate.txt, are in the folder \pm25data\iml\YYYY-Qq (for example 1999-2q) from step 9 above. Using NOTEPAD and copy and paste, combine these two files into one file with the name qQairs.txt (e.g., q1airs.txt). Move this file into the folder \pm25data\IML\airs\YYYY\Qq (e.g., 1999\1q).

11. Before submitting a quarter's data to AIRS, flag any data which exceeds flow or temperature difference limits. From the QuickBasic environment, load and run the program ALLEDINT.BAS. When prompted, enter a temporary print filename. After the program has run, examine the printout for flow (F) flags. The F flag occurs when a 5 minute average flow exceeded plus or minus 5% of 16.67 lpm. The number of these in each day is shown in the column headed #>5%&>0 (number greater then 5% and greater than zero). An F that occurs during a non-sampling day is ignored. It is usually a small flow. If it is large, then notify the operator. Many times an F occurs during a sampling day when the value in column #>5%&>0 is one. This is due to a low flow during the first five minutes of the day. It happens because there is a wait while one filter is moved out of the sampling area and the next filter is moved into the sampling area. Normally, this average flow is about 6% low. These F flags can be ignored. (This program actually ignores these F flags.) If a flow check is done on a sampling day, this will show up in the interval data with an F flag. These cases will usually have status codes of 00400000 (put in audit mode). In these cases the F flag can be ignored. This is because the monitor is not really malfunctioning. For other F flags that are not ignored, put a W flag in column 38 of the appropriate record of file \pm25data\iml\airs\qQYY.txt (for example, q299.txt). Be careful when

inserting the W because there is an I in column 80 which could be inadvertently moved out to column 81. The I should end up still in column 80. To pick the appropriate record, use the AIRS ID (columns 2-10), parameter code (columns 11-15) of 88101, POC (column 16) where 1 is regular and 2 is collocated (duplicate), and the date (columns 24-29).

12. Examine the print file from ALLEDINT.BAS for T flags. These occur when the average filter temperature exceeds the average ambient temperature by 5 degrees Celsius for a 30 minute interval. If the T flag occurs during a sampling day, then put an X into column 38 of the appropriate record of \pm25data\iml\airs\qQYY.txt (for example, q299.txt). The procedure for doing this is stated in the previous paragraph. If the T flag occurs during a non-sampling day, then determine what exposed filters were in the sampler at the time the T flag was set. This will involve finding out the pickup date and possibly pickup time (find these from the operator). If the time of the temperature difference is needed, this can be found by examining the interval data. The program, INT-TD.BAS, will list instances in the interval data where the filter temperature exceeded the ambient temperature. For any exposed filters that were in the sampler at the time the T flag was set, put an X into column 38 of the appropriate record of \pm25data\iml\airs\qQYY.txt (for example, q299.txt).

13. Submit file qQYY.txt (for example, q299.txt) to AIRS using the procedure “Submit to AIRS” (paragraph E below).

14. Calculate percent valid data, maximums, and averages. From the QuickBasic environment, load AIRS-VAL.BAS. Cursor down a few lines until you see ‘YEAR = ‘. If this is not the year of the data you are processing, enter the year. Cursor down more to ‘BEGDAYR =’. Determine the day of the month in January which sampling should have started for the regular monitors. Enter this day right after ‘BEGDAYR = ‘. Cursor down to ‘BEGDAYC =’. Determine the day of the month in January which sampling should have started for the collocated (duplicate) monitors. Enter this day right after ‘BEGDAYC = ‘. For example, if the year is 1999, then the program would have this:
YEAR = 1999
BEGDAYR = 3
BEGDAYC = 6
Run the program. When prompted, enter the AIRS filename \pm25data\iml\airs\qQYY.txt. When prompted , enter a print filename. To list the results, load the print filename in NOTEPAD or WORDPERFECT and print.

B. Hourly Data

1. Kansas City will E-mail the data each month. Detach the file to the folder \hour98\raw\YYYY\Qq (where Q is the quarter and YYYY is the year) with a name kcMMM.txt (where MMM is the month abbreviation). Some data may show up with a 4 in the first column where the data is missing. To delete these, run AIRSEDIT.BAS. The program will ask you if you want to delete the suspect record. Only delete it if the record has no valid data.

2. From the KDHE ESC computer (in Arletta's office), export AIRS records for the complete quarter of data (the ESC computer includes Wichita data). When exporting, mark the box labeled 'put null values on same line'. Copy file to diskette. Copy the file to the database computer (in the BQAR's office) into the folder \hour98\raw\YYYY\Qq where Q is the quarter and YYYY is the year. Give it a name such as kdhe.txt. Some data may show up with a 4 in the first column where the data is missing. To delete these, run AIRSEDIT.BAS. The program will ask you if you want to delete the suspect record. Only delete it if the record has no valid data. In the ESC in BQAR's office, from the ESC environment, import the file (e.g., kdhe.txt) exported above.

3. From the above files, determine the AIRS ID and the implied decimal points in each monitor's data. From the Quality Control (e.g. precision check) sheets determine the method code of each monitor and the dates it had this method code. PM10/PM2.5 TEOM monitors will have a method code of 079. The units of the TEOM monitors will be .1 UG/M3. The units of the other non-meteorological monitors will generally be .001 PPM (except CO will be .1 PPM). Temperature (TEMP) will be method 040 (electronic) and units .1 C (degrees Celsius). Barometric pressure (PRES) will be method 011 (aneroid) and units 1 MB (millibars). Solar radiation (SOL) will be method 011 (pyranometer) and units .1 LY/H (langleys/hour). Relative humidity (RH) will be method 011 (hygrothermograph) and units .1 PC (percent). Wind speed resultant (WSR) will be method 020 (vector summation instrumental) and units .1 MPH (miles/hour). Wind direction resultant (WDR) will be method 020 (vector summation instrumental) and units 1 DEG (compass degrees).

4. Using NOTEPAD, load the file site YYYY. tab where YYYY is the year. If there is no siteYYYY.tab file (this would be the case if you are entering first quarter data), load the previous year's site YYYY.tab. 'Save as' site YYYY .tab where YYYY is the new year that you are entering. This file is in the following format:
S, number, AIRS ID, location

M, method code, method start date, method end date-name of instrument
U, value of one in file, units, units start date, units end date

There is one S record for each monitor with one or more M and U records for each monitor. The 'number' starts with 01 and goes up by one for each monitor. An example of one monitor follows:

S,01,SO2,209-0021,JFK REC CENTER
M,061,0101,0407-DASIBI4108
M,060,0408,1231-TECO43A
U,.001,PPM,0408,1231

Based on the data found in step 3 above, edit the file siteYYYY.tab to make it match the data. Some monitors may have to be added. You would only delete a monitor if there are no data for the year at that monitor. One and only one pair of dates must exist for each M and U record. 'Save' the file.

5. If you are processing the first quarter of data, then you will need to create a new file by following this step. If you do create a new file according to this step, check to make sure a file HYYYY does not already exist in the folder \hour98. In the QuickBasic environment, load and run QUTIL-49.BAS. WARNING, if the file \hour98\HYYYY already exists, the data will be wiped out by this procedure. Run the program and when asked give the year (YYYY) you are processing. From the menu, pick 'initialize'. Pick all sites.

6. If you did not execute step 5 above, and if you added one or more monitors, then you will have to initialize these new monitor(s) in this manner. In the QuickBasic environment, load and run QUTIL-49.BAS. Pick initialize. WARNING: Make sure there are no data in the monitor(s) you pick, because the data will be deleted. Pick the monitor(s).

7. If you are not already running the program QUTIL-49.BAS, load and run it. Pick import AIRS. When prompted, key in one of the files built in steps 1 and 2. Repeat this procedure for each file built in steps 1 and 2.

8. Verify that no data are in error because a quality control (QC) gas was being introduced into the monitor. This should not happen because operators are supposed to disable the data loggers during any QC procedures. In QuickBasic, load and run QUTIL-49.BAS. Choose the option to export AIRS records. Move the resulting AIRS file into the folder \qcqp. In QuickBasic, load and run \qcqp\CHECK.BAS. This program will list the QC operations and the corresponding 24 hourly readings for that day the QC was done. There should be an hour or two (during business hours) of missing

data for that day. There should also be no sharp elevations of data during that day. If there are no missing data or if there is a sharp elevation, then contact the operator in order to find out if some data should be invalid during the QC operation . If the data logger reads any QC gas during an hour, than that hour's data would be invalidated. It is possible that the operator disabled the channel at 45 minutes after the hour and then enabled the channel 30 minutes later (e.g., 10:45 to 11:45). In this case, no data would be invalid because both hours have at least 45 minutes of data. The reason for any invalidation of data will be documented.

9. Check for unusually high values. Load and run QUTIL-49.BAS. List each monitor's data for the quarter. The program will asterisk any values greater than or equal these limits: .6 ppm for CO, 90 ug/m3 for PM10, 30 ug/m3 for PM2.5, and 60 ppb for the other parameters. Examine these values and those around it for any spikes. If spikes do occur or there are exceedances in any of these values, check with the operator to see if he/she know any reason for the unusual data. If the monitor was not operating properly or the monitor was biased by QC gas, the data will be invalidated.

10. If any span checks exceed 25 percent difference, then the data going back to the last valid span check will be invalidated. Check through the list of QC operations for cases of this. If there are, invalidate the applicable data. Notify the operator that you did this.

    If there are missing span checks (required every two weeks), apply the following rules when invalidating:

    * More than one span check missing, causes invalidation back to the good (<=15% difference) span check.
    * A span check from 16-25 % difference (with no recalibration), counts as missing.
    * An audit with the span point <=15% difference, counts as a good span check.
    * A good span check that is greater than 5 weeks after or before any other span checks does not validate any data.
    * A calibration with a span point <=15% difference, counts as a good span check.

11. In the Quick Basic environment, load and run QUTIL-49.BAS. Choose export AIRS. When prompted, enter a filename. Submit the resulting file to AIRS using the procedure "Submit to AIRS" (section 4.E of this AA SOP).

12. Transfer the finalized data from the quarter to the ESC computer in Arletta's

office. Arletta will make a special backup to CDROM of that applicable quarter of data prior to the transfer. She will label it “original raw data just prior to loading finalized data” and the current date. Then Arletta will erase that complete quarter of data readings from the ESC in her office. Then, the AIRS file built in step 11 above will be imported into the ESC in Arletta’s office. This will make Jim’s ESC and Arletta’s ESC contain the same data. There will also be a CDROM copy of the original raw data.

13. Every 2-3 weeks, the BQAR will make a backup of his hard disk. Every 2-3 weeks Arletta will make a backup of the ESC data in her office.

C. Quality Control (QC) Data

1. After receiving the quarter’s QC paper records, group them into hourly PC/spans, hourly calibrations, hourly audits, Hi-Vol audits, Hi-Vol calibrations, filter PM2.5 calibration, filter PM2.5 verifications, and filter PM2.5 audits. On the hourly audits, hourly PC/spans, and hourly calibrations, write the method code in the upper right-hand corner.

2. If you are doing 1^{st} quarter and no QCYYYY.wb3 file (Quattro Pro) exists for the year’s data, then initialize a QCYYYY.wb3 file in this manner. In Quattro Pro, load the previous year’s file (QCYYYY.wb3). Change cell A1 to reflect the new year. Delete rows from 7 to the end. Save as QCYYYY.wb3 where YYYY is the new year.

3. Enter the quarter’s data. Run Quattro Pro and load QCYYYY.wb3. Every record entered must have an XYZ in column AB. Enter the data following the instructions at the top of the spread sheet. Save the file.

4. Enter the collocated (precision) data for PM10 site 173-1012 in this manner. The duplicate data will be from the daily (lab) PM10 data. In the QuickBasic environment, load and run DUTIL-93.BAS. Choose list on paper. Choose site 173-1012-3. The regular data is from the hourly monitor. In the QuickBasic environment, load and run QUTIL-49.BAS. List the PM10 173-1012 data on the screen. The daily averages shown at the end of each day will be used. Refer to the lab listing just created on paper. For each date where there is data, find the daily average on the screen. Write this next to the value on paper. When entering this data, the average based on hourly readings is the regular value and the lab value is the duplicate value. Run Quattro Pro and open QCYYYY.wb3. Enter the regular values as level 1 known and the duplicate values as level 1 measured. Enter COLL in the QC_TYPE column.

5. Enter collocated PM10 data. In the QuickBasic environment, load and run COLL-93.BAS. When prompted, enter a filename. This program creates a .CSV file which can be inserted into Quattro Pro. Run Quattro Pro and open QCYYYY. Insert the .CSV file (just created) at the end of the QCYYYY spread sheet.

6. Enter the PM2.5 collocated data. In the QuickBasic environment, load and run \pm25data\AIRSPREC.BAS. When prompted about 68101-68109 data, key in 'N'. When prompted, for the existing AIRS file, key in \pm25data\iml\airs\YYYY\qQairs.txt (where Q is the quarter and YYYY is the year) (this file was built in the procedure PM2.5 Daily). When prompted for the new AIRS filename, key in \pm25data\iml\airs\YYYY\qQprec.txt (where Q is the quarter). When prompted for the new .CSV filename, key in \pm25data\iml\airs\YYYY\qQprec.csv (where Q is the quarter). After the program has run, run Quattro Pro and open QCYYYY. Insert the qQprec.csv (just created) at the end of the QCYYYY spread sheet.

7. When data entry is completed, sort the file on QC_TYPE, SITE, POLLUTANT, COMMENT, and DATE (columns H, A, B, C, and D respectively). When sorting, you are to put in the range of cells. Put A7.. ABNNN, where NNN is the last row that has data. In the box "selection contains a heading", click to make it blank. This is because you are starting with row A7 where the data starts. After clicking on sort, save the file as QCYYYY.wb3. Then also save it as QCYYYY.csv.

8. Print the data with percent differences greater than plus or minus 15% asterisked. Strart QuickBasic. Load \qcqp\list.bas. Run it. When prompted, key in qcYYYY.csv (where YYYY is the year). When prompted, key in the start date of the quarter and the end date of quarter. Load the output file into NOTEPAD or WordPerfect and print using a fixed font such as Courier New or fixedsys.

9. Start QuickBasic. Load \qcqp\airs.bas. Run the program. Submit the resulting file to AIRS using the procedure "Submit to AIRS" (section 4.E of this AA SOP).

D. PM10/TSP Intermittent Data

1. If you are processing the first quarter of data, then you will need to create a new file by following this step. If you do create a new file according to this step, check to make sure a file DYY (where YY is the year) does not already exist in the folder \lab. In the QuickBasic environment, load and run DUTIL-93.BAS. WARNING, if the file \lab\DYY already exists, data will be wiped

out by this procedure. When prompted for the year, key in the last 2 digits of the year. From the menu, pick 'initialization'. When prompted start record, key in '1'. When prompted end record, key in '1'.

2. The lab will E-mail the data in text (comma separated variable) format. Detach the file into the \lab folder. In the QuickBasic environment, load and run DUTIL-93.BAS. Pick convert lab file. When prompted, key in the lab filename. When prompted, key in a filename for the void list (for example, prvoid.txt). When prompted dry run?, key in 'Y'. Dry run means that no data will actually be built. After the program runs, note the number of records built (NNN). From the main menu of DUTIL-93.BAS, pick initialize. When prompted inventory?, key 'Y'. Note the number of records allocated. Note the number of valid (with data) records. When prompted start record?, key in the number of records allocated plus one. When prompted thru record?, key in the NNN + the number of valid records. After the program runs, from the main menu of DUTIL-93.BAS, pick convert lab file. When prompted key in the lab filename. When promoted, key in a filename for the void list (for example, prvoid.txt). When prompted dry run?, key in 'N'. After the program runs, the data will have been loaded into our database.

3. Sort the database. If you are not already running DUTIL-93.bas, in the QuickBasic environment, load and run DUTIL-93.BAS. From the main menu, pick sort. After this program run, the records will have been sorted.

4. Verify voided data. Give a copy of the void list from step 2 above to Arletta. Arletta will compare this list with her logs to verify them the voids. Also, compare this void list to the lab file, to verify that the lab file shows missing data (commas with no data).

5. Build AIRS transmittal file. In the QuickBasic environment, load and run DUTIL-93.BAS. From the main menu, pick AIRS. When prompted for year?, key in the last two digits of the year of the database. When prompted, key in 'B'. When prompted whether you want all records, key in 'Y'. When prompted whether you want all dates, key in 'N'. When prompted for start month, key in the start month in numeric form. When prompted for start day, key in the start day in numeric form. When prompted for ending month, key in the ending month in numeric form. When prompted for ending day, key in the ending day in numeric form. When prompted for the transmittal filename, key in a filename.

6. Submit the file created in step 5 above to AIRS following the procedure, Submit to AIRS.

E. Submit Data to AIRS

1. Allocate a FILE on the EPA computer. Start shortcut Env 2. Key in '55'. Key in tso. Key in 'sjx'. Key in password. From menu, pick 'allocate'. Key in 'a'. Key in filename. Key in <Enter>. Key in <Enter>. Key in <F3> several times to logoff TSO.

2. Upload the FILE to EPA's IBM mainframe computer. Start WS_FTP95 Shortcut. Enter password if changed since last running this application. Click on <ChgDir> of local system. Key in folder where FILE is located. Click on FILE on local system. Click on FILE on remote system (this was allocated in step 1 above). Click on the left-hand to right-hand arrow.

3. At the current date, data can not be transmitted by WS_FTP95 (step 2 above). EPA hopefully will solve this problem in the future so that that method can be used. Meanwhile, in order to transmit data, follow this procedure:

   On the internet, go to URL https://trex.rtpnc.epa.gov or bookmark Welcome to the USEPA's OS/390 Homepage. Click on 3270 emulator/HOD v4.3/Trial. Click on Secure Clients. Click on Cached Client. For user name: type sjx. For password: type the current password. For Security Warning, click <Yes>. For User ID:, type ssl Click <logon> Double click <Mod 2 secure>. Type TSO, <tab> sjx, <tab> current password <enter>. After waiting for 3 asterisks, type <enter>. Type 3 (utilities). Type 2. Type A. <tab> to "data set name" and type a file name with an A on the end. Type <enter>. <tab> to "record format type" and type VB. <tab> to "record length" and type 133 <enter>. Type A. <tab> to "data set name" and type a file name with a B on the end. Type <enter>. <tab> to "record format type" and type FB. <tab> to "record length" and type 80 <enter>. Type <F3> <F3> <F3>. Type 2 <enter>. Click <send>. At "PC file name", type the PC file name you wish to transmit <tab>. At "host file name", type the file name from step H. above. Click <add to list>. At "transfer mode" enter text. Click <send> Wait until completed and click <close>. Type ispf <enter> Type 3 (utilities) Type 3 (move/copy) Type C. <tab> to "dataset name". Type file name from step above <enter>. <tab> to "dataset name". Type file name from step K. above <enter>. <enter> <F3> <F3> <F3> 2 <enter>.

4. Start Env 2 Shortcut. If prompted, type jstewart, type KDHE password. Enter '55'. Enter 'airs'. Enter 'sjx'. Enter password. Enter 1. Enter 'beef'. Tab to s20aqa01, key in 's'. Key in <Enter>. Load the uploaded file into screening file.

5. In AIRS, run edit at level 3.

6. Make any corrections that are shown by the edit results. Warnings indicate only a possible error; the data will still be accepted into AIRS. On the warnings, check the data for validity. Other errors must be corrected in order for the data to be accepted into AIRS. If there are corrections to be made, make them and go back to step 4 above. If there are no corrections, continue on to step 6.

7. In AIRS, run the standard retrieval program SCAN. Verify any values marked by this program.

8. In AIRS, 'notify' that the screening file is ready for update. Any 'notify' done after Monday at 3:00 PM central time will not be processed until the following Monday at 3:00 PM central time.

9. On Thursday following the Monday AIRS processing, run the AIRS program QuickLook for the data submitted. This will provide a summary of the data submitted.

F. Submit Site and Monitor Information to AIRS

1. The Site and Monitor information have to be submitted prior to the concentration data being submitted. For each site, there are one or more monitors. Of course, once the site information has been submitted to AIRS, it does not have to be submitted again for a different monitor at that site. The site AIRS ID is made up of the state code (two digits, Kansas is 20), the county code (three digits), and a site number (four digits). The monitor ID is made up of the parameter code (five digjts) and a Parameter Occurrence Code (POC) (one digit). The POC is used to distinguish among more than one identical parameters at a site.

2. Determine the 3 digit county FIPS code. Log on to AIRS. Pick 4, geographic common. Pick 2, online browse, type in AQS. Pick 08, FIPS-area. For State, type in 20. For Area type, type in S to the left of county. For "search area name for:", type in the county name (if the name is too long to fit, leave off the ending letters). Make a note of the County Code and the AQCR. Determine the AIRS site ID. Log on to AIRS. Determine the site numbers that are currently in AIRS for this county. Pick a site number that is not in AIRS. Make a note of this state, county, site number combination (AIRS site ID).

3. Determine the Air Quality Control Region (AQCR), if not done above. Log on to AIRS. Pick 4, geographic common. Pick 2, online browse, type in AQS. Pick 08, FIPS-area. For State, type in 20. For Area type, type in S to the left of county. For area code, type in the 3 digit county code. Make a note of the AQCR as shown.

4. Determine the address of the site.

5. Determine the earliest date that any monitor started at the site.

6. Determine the FIPS city code, if any, that the site is located in. Log on to AIRS. Pick 4, geographic/common. Pick 2, online browse, type in AQS. Pick 08, FIPS-area. For state, type in 20. For area type, type in S to the left of city. For "search area name for:", type in the city name. The city code will be shown as a 5 digit number. If the site is not in a city, the city code will be 00000.

7. Determine the Metropolitan Statistical Area (MSA). Log on to AIRS. Pick 4, geographic/common. Pick 2, online browse, type in AQS. Pick 10, MSA. For "search MSA name for:", type in name of MSA. Make a note of listed MSA 4 digit code. If the site is not in an MSA, the MSA code will be 0000.

8. Determine the Land Use Code. 1=residential, 2=commercial, 3= industrial, 4=agricultural, 5=forest, 6=desert, 7=mobile, 8=blighted areas, 9=military reservation.

9. Using a map (USGS, or internet, or TIGER census maps) determine the latitude and longitude (or UTM coordinates) of the site. Also, determine the elevation of the ground at the site from a map.

10. Determine the location setting code of the site. 1=urban and center city, 2=suburban, 3=rural.

11. Determine the name of each street (or road or highway) near the site and assign each one a number (1,2,3, etc.).

12. For each street, determine the type road. 1=arterial, 2=expressway, 3=freeway, 4=major street or highway, 5=thru street or highway, 6=local street or highway.

13. For each street, determine the average traffic flow per day and the year of this average.

14. For each street, determine the direction (N, NE, E, SE, S, SW, W, NW) the street is from the site.

15. Submit the site information to AIRS in the following way.

    a. Log on to AIRS

    b. Pick 1 (submit data)

    c. Pick 3 (correct)

    d. Type input

    e. Type A1

    f. Fill out the A1 page in the following manner. Tab to action code, type I. Type state-county-site as determined above. Type 001. Type address of site. Type date first started up. Type <enter> (one key). Fix any errors (marked by <<). Type <F8> (one key).

    g. Fill out the A2 page (automatically shown on screen after the A1 page). Tab to action code, type I (may be there automatically). Type state-county-site as determined above (may be there automatically). Type city code as determined above. Type AQCR code as determined above. Type MSA code as determined above. Type elevation of ground as determined above. Type in location setting code as determined above. Type in land use code as determined above. Type <enter> (one key). Fix any errors (marked by <<). Type <F8> (one key).

    h. Fill out the A3 page(s) (automatically shown on screen after the A2 page). Tab to action code, type I (may be there automatically). Type state-county-site as determined above (may be there automatically). There will be as be as many A3 pages as there are streets. Type in the street number as determined above. Again, type in the street number. Type in the street name. Type in the type of road as determined above. Type in the average daily traffic flow as determined above. Type in the year of the average daily traffic flow as determined above. Type in the direction to the street as determined above. Type <enter> (one key). Fix any errors (marked by <<). Type <F8> (one key). Repeat the above steps for each street using the street number assigned above.

i. Fill out the A4 page (automatically shown on screen after the A3 page). Tab to action code, type I (may be there automatically). Type state-county-site as determined above (may be there automatically). Type in latitude as determined above (+DDMMSS0000). Type in longitude as determined above (-DDDMMSS0000). Type in MAP (left justified). Type in 27. Type in 24000A. Type in 1.00000SEC. Type in CENTER OF MASS OF MANMADE MATERIALS AT SITE. Type <enter> (one key). Fix any errors (marked by <<). Type <F8> (one key).

16. For each monitor, make the following determinations:

a. The 5 digit parameter code and one digit POC

b. Monitor type code (1=NAMS, 2=SLAMS, 3=SPM)

c. Start-up date (YYMMDD)

d. Analysis lab code (001, except PM2.5 filter monitors are 008)

e. Measurement scale (1=micro, 2=middle, 3=neighborhood, 4=urban, 5=regional)

f. Monitoring objective code (1 = highest concentration, 2 = population exposure, 3 = general/background, 4 = source impact, 8 = regional transport, 9 = welfare related impacts)

g. Urban area represented (site does not have to be in urban area represented): If does not represent urban area, then this is 0000 and skip to 16.h below. Log on to AIRS. Pick 4, geographic/common. Pick 2, online browse. Type in AQS. Pick 17, urban area. Type in name of urban area. Note the resulting 4 digit urban area.

h. For each street, determine the distance in meters from the site.

i. Probe location code (1 = top of building, 2 = on support at ground level, 3 = side of building, 4 = pole, 5 = other, 6 = tower

j. Probe height above ground in meters

k. Distance (meters) of probe from support in horizontal direction (9= > or = 9)

l. Distance (meters) of probe from support in vertical direction (9 = > or = 9)

17. For each monitor, submit the following information to AIRS in the following way.

a. Log on to AIRS
b. Pick 1 (submit data)
c. Pick 3 (correct)
d. Type input
e. Type F1
f. Fill out the F1 page

(1) Tab to Action Code and type in I
(2) Type in state-county-site
(3) Type in parameter-POC
(4) Type in monitor type code from above
(5) Type in start-up date (YYMMDD)
(6) Type in analysis lab code from above
(7) For collection lab code, type 001
(8) For reporting organization, type in 001
(9) For rep. org. effective date, type in the start-up date (YYMMDD)
(10) For date sampling began, type in the start-up date (YYMMDD)
(11) For measurement scale code, type in the code determined above
(12) For monitoring objective code, type in the code determined above
(13) For urban area represented, type in the urban area determined above
(14) Type <enter> (one key)
(15) Fix any errors (marked by <<)
(16) Type <F8> (one key)

g. Fill out the F2 page

(1) Tab to Action Code and type in I
(2) Type in state-county-site
(3) Type in parameter-POC
(4) For each street, type in the number assigned above
(5) For each street, type in the distance in meters (right justified) as determined above

(6) For reference method used, type in Y or N
(7) For reference method started, type in start-up date (YYMM) if (6) was Y
(8) For QA plan, type Y
(9) For QA effective date, type start-up date (YYMM)
(10) For probe location code, type in code determined above
(11) For probe height, type in probe height in meters (right justified) determined above
(12) For dist from support horiz, type value determined above
(13) For vert., type in distance from support vertical as determined above
(14) Type <enter> (one key)
(15) Fix any errors (marked by <<)
(16) Type <F8> (one key)

h. Fill out the F3 page only if the monitor is PM10 or PM2.5 local conditions.

(1) Tab to Action Code and type in I
(2) Type in state-county-site
(3) Type in parameter-POC. If PM2.5 skip to step 6 below
(4) For monitoring area, type in 2099
(5) For worst site, type in 2
(6) Tab to required sampling frequency, type in number of days between sampling, for example, 6= every sixth day sampling
(7) For “effective date”, type start-up date (YYMMDD)
(8) Type <enter> (one key)
(9) Fix any errors (marked by <<)
(10) Type <F8> (one key)

i. Fill out the F4 page (this is an optional comments page)

(1) Tab to Action Code and type in I
(2) Type in state-county-site
(3) Type in parameter-POC
(4) Type in comment

G. Calculate Local Conditions Data

1. After a quarter’s hourly and KDHE lab data have been processed, this procedure is used to build and submit local conditions data for hourly PM10, hourly PM2.5, and filter PM10. In the normal processing of these types of

data, they were submitted as standard conditions.

2. Build AIRS records of all these type of data named in step 1 above. Copy the hourly data file into one file in folder \actual and copy the filter data file into another file in folder \actual. From the section meteorologist, obtain the applicable weather data and copy it onto Jim's hard drive.

3. From the QBasic environment, load and run \actual\D-CHECK.BAS. When the program requests, type in the AIRS filter data file from step 2 above. Missing temperature (dry bulb degrees F) and missing station pressure (inches of mercury) data will be listed by the program. Determine an approximate temperature and/or pressure to substitute for the missing in one of two ways. If there is a reading one hour earlier or one hour later than the missing, use that reading. Otherwise, look at the nearest weather station with the missing data and use that. Use the temperature as is. However, for station pressure, find out the difference in elevation in feet (nearest weather station minus original weather station) between the two weather stations. This difference will be negative if the nearest weather station is lower than the original station.

   pressure at original station = pressure of nearest weather station plus (difference in elevation / 1000)

   For example, the original station has an elevation of 1000 feet. The nearest station has an elevation of 500 feet and a station pressure of 29.00 inches of mercury.

   pressure at original station = 29 + ((500 - 1000)/1000) = 29 - .50 = 28.50

   Make a note of all the approximated temperatures and pressures made.

4. From the QBasic environment, load and run \actual\D-CONV.BAS. When the program requests, type in the AIRS filter data file from step 2 above. For the missing temperatures and pressures, the program will ask you if you know the temperatures and pressures. Since you determined these in step 3 above, type in Y. Then type in the approximated temperature or pressure as determined in step 3 above. Submit the resultant AIRS file to AIRS using the procedure "Submit to AIRS".

5. From the QBasic environment, load and run \actual\H-CHECK.BAS. When the program requests, type in the AIRS hourly data file from step 2 above. Missing temperature (dry bulb degrees F) and missing station pressure (inches of mercury) data will be listed by the program. Determine an

approximate temperature and/or pressure to substitute for the missing in one of two ways. If there is a reading one hour earlier or one hour later than the missing, use that reading. Otherwise, look at the nearest weather station with the missing data and use that. Use the temperature as is. However, for station pressure, find out the difference in elevation in feet (nearest weather station minus original weather station) between the two weather stations. This difference will be negative if the nearest weather station is lower than the original station.

pressure at original station = pressure of nearest weather station plus (difference in elevation / 1000)

For example, the original station has an elevation of 1000 feet. The nearest station has an elevation of 500 feet and a station pressure of 29.00 inches of mercury.

pressure at original station = 29 + ((500 - 1000)/1000) = 29 - .50 = 28.50

Make a note of all the approximated temperatures and pressures determinations.

6. From the QBasic environment, load and run \actual\H-CONV.BAS. When the program requests, type in the AIRS hourly data file from step 2 above. For the missing temperatures and pressures, the program will ask you if you know the temperatures and pressures. Since you determined these in step 5 above, type in Y. Then type in the approximated temperature or pressure as determined in step 5 above. Submit the resultant AIRS file to AIRS using the procedure “Submit Data to AIRS”.

H. Documentation of Changes to AIRS

For any changes or deletions to AIRS data, follow this procedure. In a paper file, record the site, monitor, date of data collection, old value, new value, reason for change, the person making the change, current date.

V. Quality Control Sampling

This is not applicable because there is no sampling in this procedure.

VI. Preparation and Analyzing Samples in the Field

This is not applicable because there are no samples taken.

VII. Transport, Transferring, and Storing Samples

See paragraph IV above.

VIII. Data Acquisition and Processing

See paragraph IV above.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

Personal computer.

Section 5

Training

I. Overview

This section describes the required training of sample collectors, equipment/instrument operators, auditors, data processors, and quality assurance staff.

II. Technical Qualifications

A. Persons evaluating the operation of monitors/samplers must be familiar with the operation of electro/mechanical equipment. Some minor repair and/or adjustments may be necessary.

B. Computer skills are essential for programming many types of monitors/samplers and for problem diagnosis and troubleshooting. Persons operating many types monitors/samplers must have PC (and/or Laptop and/or Palmtop) computer skills to input commands and download data.

C. Working familiarity with electronic and mechanical test equipment and procedures is required in order to troubleshoot and repair samplers.

D. At least two people from each agency (i.e., KDHE and local agencies) are expected to maintain proficiency in monitors/samplers operations and routine maintenance.

III. Calibration and Troubleshooting

This is not applicable.

IV. Collection of Data Including Operating Procedure

A. New Employees

1. New employees (including recent transfers from other programs) shall receive a thorough indoctrination into the QA policies and procedures of the Ambient Air Quality Monitoring Program.

2. The Divisional Quality Assurance Management Policies and Procedures (Part I of the Division of Environment Quality Management Plan), the Bureau of Air and Radiation Quality Assurance Management Plan (Part II), the Ambient Air Monitoring Quality Assurance Program Plans and associated

SOP's, shall be required reading on the part of all employees.

3. All new employees shall participate in the orientational seminars offered by the KDHE Personnel Office. New supervisors are also expected to complete the introductory course for supervisors offered by the Department of Administration.

B. Practical Training

1. Self-instructional

a. The first phase of training is self-instructional. Immediate access to monitors/samplers during this phase is recommended. Printed materials intended for study include the documents listed in paragraph 2 below.

b. Obtain access to a monitors/samplers. This is recommended in order to:

(1) Develop familiarity with the monitor/sampler; and

(2) Provide initial hands-on experience in preparation for the practical phase of training.

2. Study applicable printed materials which include the following:

a. 40 CFR 50, Appendix L, Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere;

b. Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, USEPA, Environmental Monitoring Systems Laboratory, Research Triangle Park, NC;

c. Operating Manual: Partisol-Plus Model 2025 Sequential Air Sampler, Rupprecht & Pataschnick Co., Inc., 25 Corporate Circle, Albany, NY 12203;

d. Service Manual: Partisol-Plus Model 2025 Sequential Air Sampler, Rupprecht & Pataschnick Co., Inc., 25 Corporate Circle, Albany, NY 12203;

e. Ambient Air Monitoring Criteria Pollutants Quality Assurance Project Plan, Kansas Department of Health and Environment, Division of Environment, Bureau of Air and Radiation, Air Monitoring Services Section, Topeka, KS;

f. Ambient Air Monitoring Standard Operating Procedures, Kansas Department of Health and Environment, Division of Environment, Bureau of Air and Radiation, Air Monitoring Services Section, Topeka, KS;

g. Ambient Air Monitoring Non-Criteria Pollutants Quality Assurance Project Plan, Kansas Department of Health and Environment, Division of Environment, Bureau of Air and Radiation, Air Monitoring Services Section, Topeka, KS;

h. 40 CFR 58, Appendix A, QA Requirements for SLAMS;

i. Other EPA printed materials as available;

j. Applicable Operator's Manual;

k. EPA videotapes relating to sampler operation.

3. On-the-job Training (OJT)

a. Overlap of OJT with self-study of printed materials may be necessary and may facilitate learning. OJT provides hands-on experience that is derived from activities in the shop as well as in the field. OJT will be used for all personnel. The trainee will perform the following steps in order to complete OJT for a task.

b. Observe an experienced person doing the necessary task.

c. Study any available operational procedures for the task (See paragraph 2 above).

d. Perform the task under the direct supervision of an experienced person.

e. Repeat the above steps until the supervisor judges the performance of the trainee to be satisfactory.

f. When working in the field with technical equipment and scientific instrumentation, unique problems may arise for which there is no precedent. The solutions to such problems must be achieved through application of paragraph 3.c above in conjunction with consultation with coworkers.

C. Continuing Education

1. The Bureau of Air and Radiation (BAR) maintains a library of educational materials which may be utilized for continuing educational purposes.

2. The Bureau of Air and Radiation maintains a satellite television receiver system which is available for continuing educational purposes.

3. Continuing educational courses, workshops, or symposia offered by colleges, vocational educational institutions, or various governmental agencies may be attended by appropriate staff. In order for an employee to participate, the subject matter must be applicable to a program or project, funding must be available, and supervisory and administrative approval must be secured in advance.

D. General Field Training Requirements

1. Practical training is emphasized. This includes on-the-job training (OJT) and hands-on experience for each of the following:

   a. monitor/sampler operation;

   b. data collection;

   b. maintenance;

   c. calibration; and

   d. major repair

2. To ensure consistent operation of all monitors/samplers within the Kansas Ambient Air Monitoring Network, all site operators must demonstrate proficiency in sampler calibration, operation, and data collection to the KDHE Field Technician Supervisor. KDHE/BAR will train, assist, and observe all new operators.

3. The Field Technician Supervisor will randomly accompany site operators to observe their on-site procedures.

E. Health and Safety Warnings

1. General safety precautions related to electrical hazards must be observed at all times when working with electronic equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electronic equipment in wet conditions, as frequently encountered at field monitoring sites.

2. Persons operating the R&P Partisol-Plus Model 2025 Sequential Air Sampler or cleaning the WINS impactor should review the Material Safety Data Sheet (MSDS) for the WINS impactor oil.

3. General precautions for working with heavy equipment, and electro/mechanical equipment with moving parts must be observed.

F. Cautions

Although field equipment is manufactured to withstand environmental extremes, it is precision equipment with relatively fragile electronic and mechanical parts. All field equipment used for environmental measurements should be handled with care.

V. Quality Control Sampling

This is not applicable.

VI. Preparation and Analyzing Samples in the Field

This is not applicable.

VII. Transport, Transferring, and Storing Samples

This is not applicable.

VIII. Data Acquisition and Processing

This not applicable.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document and Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

This is not applicable.

Section 6

METEOROLOGICAL MONITORING

I. Overview

This section describes the procedures used by monitoring personnel when measuring the following ambient air parameters: wind direction (vector average), wind speed (vector average), temperature, barometric pressure, solar radiation, and relative humidity.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration And Troubleshooting

These monitors will be set up and started following the manufacturer's instructions. Any troubleshooting will be done following the manufacturer's instructions. Temperature calibration checks will be performed annually by comparing the monitor reading to a certified temperature standard. Barometric pressure calibration checks will be performed annually by comparing the monitor reading to a certified barometric pressure standard. All calibration activities will be recorded.

IV. Collection of Data Including Operating Procedures

A. Siting Guidelines

The wind sensor will be 9 to 11 meters above ground height. The temperature sensor, relative humidity sensor, barometric pressure sensor, and the solar radiation sensor will 3 to 5 meters above ground. There will be as few obstructions around the sensors as possible.

B. Operation

Operate the monitors according to the manufacturer's instructions. Perform preventive maintenance according to the manufacturer's instructions and record any maintenance done. The time of day will be CST throughout the year.

V. Quality Control Sampling

None will be done.

VI. Preparation And Analyzing Samples in The Field

The monitors and data logger automatically analyze for the applicable parameters.

VII. Transport, Transferring, And Storing Samples

A data logger on site will store the data automatically. The central office data computer will automatically poll the data logger via modem and telephone line. The central office data computer will be set to CST throughout the year. For further details, see AAM SOP, Section 3 and 4.

VIII. Data Acquisition And Processing

The central office data computer will store the data on an Environmental Services Corporation (ESC) data base. For further details, see AAM SOP, Sections 3 and 4.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document and Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

Data logger, modem, tower, shelter, five volt and twelve volt power supply, wind sensor, barometric pressure sensor, relative humidity sensor, solar radiation sensor, temperature sensor, certified barometric pressure standard, and certified temperature standard.

Section 7

SOIL SAMPLING

I. Overview

A. This section describes the collection of soil samples in the vicinity of an ambient air monitoring site.

B. Soil samples are collected in the immediate area of a TSP, $PM_{2.5}$, or PM_{10} sampler to determine if there is localized reentrainment of soils. Periodic soil sampling at the same site can provide data indicative of accumulation due to airborne particulate deposition on the soil surface from a local source.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

Calibration is not applicable. Troubleshooting will be performed according to the instructions in chapter 19 of the User's Guide and Reference Manual (UGRM) for Environmental Systems Corporation's (ESC's) ambient air quality data acquisition software (E-DAS Ambient for Windows).

IV. Collection of Data Including Operating Procedures

A. Locate a representative area in the general area of interest. Avoid disturbed areas, areas close to roadways, drainage ditches, close to buildings or equipment storage, under tree drip lines, etc.

B. Collect a soil surface sample approximately three inches in diameter and one/half inch deep and place in container. Repeat collections for 10-15 random sites in an approximate 200 by 200 ft area.

C. Mix soils thoroughly in container. Fill sample bag with composite sample. Write information on sample bag.

D. Samples are identified by a YY/MM/DD/SS number consisting of year, month, day and a sample number. Include City, County and Facility name, and/or AIRS number if applicable.

E. Document any special reasons for collecting sample, or analysis requirements. Locate sampling area on a map or make detailed sketch especially if area must be sampled annually as per operating permit.

F. Complete Laboratory Sample Submission form for each sample collected and submit to KHEL in a timely manner.

G. Wipe down equipment between samples to avoid cross-contamination of samples.

V. Quality Control Sampling

None will be done in the field.

VI. Preparation and Analyzing Samples in the Field

See paragraph 4 above.

VII. Transport, Transferring, and Storing Samples

See paragraph IV above.

VIII. Data Acquisition and Processing

Either hard copy or electronic spreadsheets are maintained with data results.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

A. Trowel or scoop for removing soil surface.

B. Inert container for combining several soil samples into a composite sample.

C. Sample bag (KSU soil sample)

D. Pen

E. Sample information form

F. Map for recording/relocating sample site

Section 8

OPERATION OF STAINLESS STEEL FLASKS

I. Overview

This procedure describes the collection of ambient air samples in stainless steel spherical flasks.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

IV. Collection of Data Including Operating Procedures

A. Principle and Applicability

Clean spherical six (6) liter capacity stainless steel flasks can be used to sample ambient air. A grab sample can be obtained by opening a valve on an evacuated flask and subsequently closing the valve when a hissing sound ceases; this generally takes 1 - 2 minutes. Longer fill times (up to several hours) can be achieved through the use of a flow regulator. A larger volume of air can be sampled through the use of a pump which forces air into the sphere, pressurizing the system to nearly 15 psig, equivalent to twelve (12) liters of air at standard conditions.

B. The contracting/EPA laboratory will clean and prepare the flasks.

C. Sampling Procedures

1. Grab Sample

a. Remove protective cap from inlet valve. Measure and record initial vacuum

b. When in position for sampling (e.g., within a plume), open valve about two (2) full turns.

c. Listen for hissing sound; if there is no sound, mark the sphere for return to the shop for cleaning, and start over using another sphere.

d. When hissing sound ceases (within 1 -2 minutes), sampling is complete. Close the inlet valve securely.

e. Replace protective cap on inlet valve. Measure and record final vacuum.

f. Complete all necessary documentation as required by the laboratory.

2. Timed Sample

a. Remove protective cap from inlet valve. Measure and record initial vacuum.

b. Attach a flow controller to the valve, and tighten securely.

c. When in position for sampling (e.g., within a plume), open valve about two (2) full turns.

d. There will be no sound as the sphere fills.

e. Calculate sampling time as:

$$\frac{6000}{\text{cc/min on flow controller}} = \text{minutes to sample}$$

f. When time has elapsed, close the valve securely.

g. Remove the flow controller. Measure and record final vacuum.

h. Replace protective cap on inlet valve.

i. Complete all necessary documentation as required by the labaoratory.

3. Pressurized Sample

a. The six liter flasks are filled to 14.7 psig during sampling. This is 12 liters of air at standard conditions. Measure and record initial pressure.

b. Using a valve connected to the pump inlet, set a desired flow rate so that 12 liters are sampled.

c. When the sampling time is complete, close the sample inlet valve.

d. Attach a pressure gauge to the flask. Measure and record the final pressure in psig.

e. Make this calculation:

$$V = \frac{V_1 \ (14.7 + P_1) \ 298}{14.7 \ T_1}$$

Where:

V = The volume sampled at standard conditions

V_1 = Volume of the flask

P_1 = Pressure measured in the flask (psig)

T_1 = Temperature in the flask (K)

f. Record: The starting and stopping time of the sampling, the flask number, the valve number, the valve setting, the flask pressure after sampling, the temperature in the flask, the volume sampled at standard conditions, the location, your name, and the date.

V. Quality Control Sampling

Duplicate (collocated) sampling is recommended whenever possible, depending upon sampling conditions and availability of extra stainless steel flasks. Comparison of results from such collocated samples facilitates evaluation of the precision of the sampling method together with that of the analytical method employed.

VI. Preparation and Analyzing Samples in the Field

See paragraph IV above.

VII. Transport, Transferring, and Storing Samples

See paragraph IV above.

VIII. Data Acquisition and Processing

Either hard copy or electronic spreadsheets are maintained with data results.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

A. Vacuum source and fittings (for evacuation)

B. Cleaned and evacuated spherical stainless steel flask

C. Source of ultrazero air

D. Flow regulator (for timed sampling)

E. Air pump and connecting equipment (for pressurized sampling)

Section 9

PM2.5 INTERMITTENT SAMPLING

I. Overview

This section describes the procedures for measuring $PM_{2.5}$ concentrations in the ambient air using Rupprecht & Pataschnick (R&P) Partisol-Plus Model 2025 Sequential $PM_{2.5}$ samplers. Following collection of samples and measurement of flow rates in the field, concentrations are determined by a contracting laboratory by micro-gravimetric analysis. The samplers collect one sample during a 24 hour calendar day, then stop and began sampling at another day (hence, they are referred to as intermittent). On July 18,1997 (Federal Register: Vol. 62, No. 138, Friday, July 18,1997), the United States Environmental Protection Agency (EPA) promulgated a filter-based $PM_{2.5}$ standard (40 CFR Part 50), which requires establishment of a national monitoring network. The state of Kansas, through the Kansas Department of Health and Environment (KDHE), was obligated to adopt the new standard and establish a statewide $PM_{2.5}$ monitoring network. In conjunction with this commitment, KDHE has agreed to participate in EPA's National Contract for the Purchase of $PM_{2.5}$ Monitoring Equipment to fulfill its equipment needs. Under terms of the contract, KDHE selected the Rupprecht & Pataschnick (R&P) Partisol-Plus Model 2025 Sequential Air Sampler as its monitor of choice. This procedure applies only to R&P Partisol-Plus Model 2025 Sequential $PM_{2.5}$ samplers incorporated into the Kansas Ambient Air Monitoring Network.

II. Technical Qualifications

A. All field operations personnel must be familiar with environmental field measurement techniques.

B. Those who service the $PM_{2.5}$ sampler in the field must be very conscientious and attentive to detail in order to report complete $PM_{2.5}$ data of high quality.

C. Persons qualified to perform $PM_{2.5}$ field operations must be able to:

a. Operate the $PM_{2.5}$ sampler;

b. Calibrate, audit and troubleshoot the $PM_{2.5}$ sampler; and

c. Use common methods to determine temperature, pressure, flow rate and relative humidity (RH) in the field.

III. Calibration and Troubleshooting

A. PM2.5 Sampler Temperature Sensors Verification and Calibration

1. Summary of Method

a. Three temperature sensor calibrations (ambient air, filter compartment, and filter) should be performed upon installation of the sampler and annually thereafter. Additional temperature sensor calibrations should be performed upon failure of a temperature verification.

b. Ambient air and filter temperature verifications are performed and recorded every 4 weeks to insure specification compliance.

c. Verifications fail when the sampler's temperature measurement system differs by +/- 4^{o}C or more from the temperature measured by the temperature standard.

d. Temperature calibrations (ambient air, filter compartment, and filter) are performed upon failure of verifications.

2. Equipment

a. External Thermometer (NIST-traceable minithermometer transfer standard, see AAM SOP Section 10)
b. PM2.5 Sequential Sampler

3. Ambient Air Temperature Verification Procedure

a. Ambient Air temperature verification is performed according to the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

4. Filter Temperature Verification Procedure

a. Load an empty (i.e., no filter support screen or filter) filter cassette into sample position.

b. Remove the WINS $PM_{2.5}$ impactor.

c. Determine the current temperature (^{o}C) at the filter temperature sensor using an external thermometer.

d. Verify that the value of Filt Temp displayed in the Audit Screen is within +/- 4^{o}C of the measured temperature. If this is not the case, perform the filter temperature calibration procedure described in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

e. Remove external thermometer.

f. Remove the empty filter cassette from the sampling position.

g. Reinstall the WINS $PM_{2.5}$ impactor.

5. Temperature Calibration Procedures

a. Temperature calibrations (ambient air, filter compartment, and filter) are performed upon failure of verifications.

b. Temperature calibrations are performed as specified in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

6. Documentation

a. Record the sampler ID, date, person, temperature transfer standard (minithermometer) ID, all readings from the minithermometer, and corresponding temperature readings from the PM2.5 sampler.

b. Submit this documentation to the Bureau QA Representative.

B. PM2.5 Sampler Pressure Sensor Verification / Calibration

1. Summary of Method

a. Perform the ambient pressure calibration upon installation of the sampler, and then annually or when out of specifications.

b. To ensure compliance with specifications, perform the ambient pressure verification (single point) at least every 4 weeks.

2. Equipment

a. A field barometer is used as a transfer standard. For certification of the transfer standard, see AAM SOP Section 10.

b. PM2.5 Sampler

3. Ambient Pressure Calibration Procedure

a. Follow the instructions in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

4. Single-point Ambient Pressure Verification

a. Record the pressure value shown on the monitor.

b. Record the transfer standard reading.

c. Compare the values. (The monitor value should be within $\pm$10 mm Hg of the measured ambient pressure. If this is not the case, perform the ambient pressure calibration referenced in paragraph III.B.3 above.)

5. Documentation

a. Record the sampler ID, date, person, pressure transfer standard ID, all readings from the pressure transfer standard, and corresponding pressure readings from the PM2.5 sampler.

b. Submit this documentation to the Bureau QA Representative.

C. PM2.5 Sampler Flow Rate Verification, Calibration, and Audit

1. Scope and Application

a. This procedure is intended for verification or calibration of flow rate for sequential $PM_{2.5}$ samplers in the Kansas Ambient Air Monitoring Network using a transfer standard.

b. This procedure applies only to Rupprecht & Pataschnick Partisol-Plus Model 2025 Sequential $PM_{2.5}$ samplers incorporated into the Kansas Ambient Air Monitoring Network.

c. The sampler flow rate measurement system must be calibrated using actual (uncorrected) flow rates at ambient temperature and pressure (as opposed to standard volumetric flow rate, which is corrected to standard temperature and pressure).

d. Single point flow rate verifications are performed every four (4) weeks.

e. Multi-point flow rate calibrations are performed at installation of a sampler and annually thereafter.

f. Multi-point flow rate calibrations are performed upon failure of a single point flow rate verification.

g. Failure of the flow rate verification occurs when the sampler's flow rate indicator differs by $\pm$ 4% or more from the flow rate transfer standard.

h. Verification/calibration data are recorded in the site log and reported to the Bureau QA Officer on a quarterly basis.

i. A flow rate audit is performed according to the single point flow rate verification procedure (see paragraph III.C.7 below). The flow rate transfer standard used for a flow audit must be different from the transfer standard used for the sampler flow rate calibration. It is preferable (when possible) to have someone perform the audit who did not perform the sampler flow rate calibration.

2. Summary of Method

a. A clean filter is installed in the filter holder.

b. The sample inlet is removed from the downtube.

c. A flow rate adapter is installed on the downtube.

d. A flow rate transfer standard is connected to the flow rate adapter.

e. The instrument flow rate and flow rate transfer standard values are recorded and compared.

3. Cautions

a. Take care to minimize air leaks between the flow rate transfer standard and the sampler inlet.

b. The digital electronic manometer is sensitive to changes in temperature. Limit exposure to thermal gradients, and allow time for thermal equilibration prior to use. Zero the manometer immediately prior to measurement. Obtain measurements as quickly as possible (as soon as a stable reading is obtained).

c. Replace the batteries in the digital electronic manometer frequently.

d. Cross-check the digital electronic manometer against a U-tube manometer during the multi-point transfer standard calibration.

4. Interferences

a. Extremely cold temperatures will interfere with the proper functioning of the BIOS DryCal Flow Standard.

b. Wind may cause manometer fluctuations. A wind screen may need to be employed to improve manometer stability.

5. Personnel Qualifications

a. Persons conducting flow rate verification or calibration must be trained in the use of the specific apparatus required.

b. Working familiarity with various types of flow rate standards will be helpful.

6. Equipment

a. The flow rate transfer standard employed should be capable of measuring flows in the range of 15-20 liters per minute.

b. The transfer standard must be certified. Certification must be NIST-traceable.

c. Annual recertification of the flow rate transfer standard is required. See AAM SOP Section 10 for certification procedure.

d. Either of the two (2) following flow rate transfer standards is acceptable:

(1) Streamline Flow Transfer Standard with 10" H_2O electronic

manometer; or

(2) BIOS DryCal Flow Standard (not to be used at extremely cold temperatures)

7. Single Point Flow Rate Verification Procedure

a. Perform the flow verification procedure described in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

8. Multi-point Flow Rate Calibration Procedure

a. Perform the flow calibration procedure described in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

b. Reset the sampler flow rate to approximately 10% below the sampler's operational flow rate of 16.67 liters per minute (i.e., approximately 15.00 liters per minute), and repeat the flow calibration procedure.

c. Reset the sampler flow rate to approximately 10% above the sampler's operational flow rate of 16.67 liters per minute (i.e., approximately 18.34 liters per minute), and repeat the flow calibration procedure.

d. After the calibration is complete, perform a single point flow rate verification at the sampler's operational flow rate (16.67 liters per minute).

9. Audit Procedure

a. A flow rate audit is performed according to the single point flow rate verification procedure (see paragraph III.C.7 above). The flow rate transfer standard used for a flow audit must be different from the transfer standard used for the sampler flow rate calibration. It is preferable (when possible) to have someone perform the audit who did not perform the sampler flow rate calibration.

b. Each sampler will be audited once per calendar quarter.

10. Documentation

a. Record the sampler ID, date, person, flow rate transfer standard ID, all readings from the flow rate transfer standard, and corresponding flow readings from the PM2.5 sampler.

b. Submit this documentation to the Bureau QA Representative.

D. Perform any troubleshooting procedures according to the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

E. Health and Safety Warnings

1. General safety precautions related to electrical hazards must be observed at all times when working with electronic equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electronic equipment in wet conditions, as frequently encountered at field monitoring sites.

2. Refer to Section 2.3 (Health and Safety Warnings) of the EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Sec.2.12, "Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference or Class I Equivalent Methods".

IV. Sampling Operations

A. Summary of Method

1. The R&P Partisol-Plus Model 2025 Sequential Air Samplers incorporated into the Kansas Ambient Air Monitoring Network have been designated as reference samplers (method designation RFPS-0498-118). These samplers thus meet the requirements for operation in accordance with 40 CFR 50, Appendix L, Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere.

2. The R&P Partisol-Plus Model 2025 Sequential Air Samplers incorporated into the Kansas Ambient Air Monitoring Network are operated in accordance with the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

3. Whenever possible, the R&P Partisol-Plus Model 2025 Sequential Air Samplers incorporated into the Kansas Ambient Air Monitoring Network are operated in accordance with EPA's Quality Assurance Handbook for Air

Pollution Measurement Systems, Vol. II, Sec.2.12.

B. Safety

1. Persons operating the R&P Partisol-Plus Model 2025 Sequential Air Sampler or cleaning the WINS impactor should review the Material Safety Data Sheet (MSDS) for the WINS impactor oil.

C. Cautions

1. Damage to the $PM_{2.5}$ sampler may result if caution is not taken to properly install and maintain the device. Follow the manufacturer's instructions for maintenance of $PM_{2.5}$ equipment, and for safe, secure installation.

D. Personnel Qualifications

1. All field operations personnel must be familiar with environmental field measurement techniques. Practical experience in the operation and maintenance of the R&P Partisol-Plus Model 2025 Sequential Air Sampler is essential to operation in the field.

2. Those who service the $PM_{2.5}$ sampler in the field must be very conscientious and attentive to detail in order to report complete $PM_{2.5}$ data of high quality.

3. Persons qualified to perform $PM_{2.5}$ field operations must be able to:

   a. Operate the $PM_{2.5}$ sampler;

   b. Calibrate, audit and troubleshoot the $PM_{2.5}$ sampler; and

   c. Use common methods to determine temperature, pressure, flow rate and relative humidity (RH) in the field.

4. Computer skills are essential for proper programming of the sampler and for problem diagnosis and troubleshooting.

E. Equipment

1. Rupprecht & Pataschnick Partisol-Plus Model 2025 Sequential Air Sampler

2. $PM_{2.5}$ Teflon filter elements 47mm in diameter. Each should be housed in an appropriate filter cassette.

3. Rupprecht & Pataschnick Palmtop Data Acquisition System (PDAS) or equivalent (e.g., HP 360LX or higher model number with Windows CE2.0 or higher version, appropriate connecting hardware, and appropriate R&P communications and data management software) or laptop computer (configured with Windows 95, Windows98, or Windows NT, appropriate connecting hardware, and appropriate R&P communications and data management software).

F. Method Calibration

1. Calibrate the sampler temperature sensors in accordance with paragraph III above.

2. Calibrate the sampler ambient air pressure sensor in accordance with paragraph III above.

3. Calibrate the sampler flow rate in accordance with paragraph III above.

G. Sampler Operation

1. Operate each sampler in accordance with the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

H. Field Maintenance

1. Summary of Method

a. Perform field maintenance every five sampling days, monthly, and quarterly in accordance with the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual, and table 9-1 (appearing on page 6 of this SOP as Table A-10.1.) in section 9.0 of the EPA Quality Assurance Guidance Document 2.12, "Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference or Class I Equivalent Methods".

2. Cautions

a. Damage to the $PM_{2.5}$ sampler may result if caution is not taken to properly install and maintain the device. Follow the manufacturer's instructions for maintenance of $PM_{2.5}$ equipment, and for safe, secure installation.

3. Equipment

a. Flow Audit Adapter for external leak check

b. 47 mm Leak Check disk in filter cassette for internal leak check

c. WINS impactor assembly for change out (must be properly cleaned and reoiled)

d. An alcohol-based general purpose cleaner

e. Cotton swabs

f. Small, soft bristle brush

g. Paper towels

h. Distilled water

i. Miscellaneous hand tools

j. Spares (i.e., O-rings, V-seals, silicone grease, etc.)

4. Field Maintenance Procedures

a. Field maintenance procedures are described in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual and Table 9-1 (appearing below in Appendix F) in section 9.0 of the EPA Quality Assurance Guidance Document 2.12, "Monitoring $PM_{2.5}$ in Ambient Air Using Designated Reference or Class I Equivalent Methods".

b. Perform external and internal leak checks upon installation of a sampler, and subsequently after every four (4) weeks of operation. These leak check procedures are described in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

c. Replace the WINS impactor assembly with a clean one after every four (4) sampling runs. This procedure is described in the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

d. For each preventive or remedial maintenance activity, record the sampler ID, the date, the person, and the action taken.

I. Filter Handling and Transport

1. Scope and Application

a. $PM_{2.5}$ monitoring of ambient concentrations of $PM_{2.5}$ is accomplished by means of collection of particulate samples. For this purpose, KDHE/BAR employs Rupprecht & Pataschnick (R&P) Partisol-Plus Model 2025 Sequential Air Samplers which collect fine particulate on 47 mm diameter Teflon filter elements.

b. These filter elements are quite fragile, and $PM_{2.5}$ samples must be protected from contamination and/or analyte loss which may affect analytical results. Special handling is required to ensure the integrity of these samples.

c. This SOP describes handling and transport of $PM_{2.5}$ filter elements.

2. Summary of Method

a. EPA provides unexposed 47 mm diameter Teflon filter elements.

b. The clean filters are sent to the contract analytical laboratory for proper physical inspection, conditioning and determination of tare weights. The primary KDHE/BAR contract specification requires that the contracting laboratory conduct all filter handling in accordance with 40 CFR 50, Appendix L, Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere. Whenever possible, the $PM_{2.5}$ filter elements are also handled in accordance with EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Sec.2.12. Deviations from Sec. 2.12 must be approved by KDHE/BAR per contract. All contract analytical laboratory activities are conducted in accordance with the laboratory's SOPs.

c. After tare weights have been determined at the contract laboratory, filter elements are shipped to KDHE/BAR and to local agencies conducting $PM_{2.5}$ sampling under Memoranda of Agreement with KDHE/BAR. These filters must be exposed within thirty (30) days of determination of tare weight.

d. Filter elements are handled in the field in accordance with 40 CFR 50, Appendix L, Reference Method for the Determination of Fine

Particulate Matter as $PM_{2.5}$ in the Atmosphere and the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual.

e. Retrieval of exposed filter elements and associated data is accomplished in accordance with paragraph IV.G above.

f. Exposed filter elements are transported to the contract analytical laboratory in equipment meeting the requirements specified in 40 CFR 50, Appendix L, Section 10.13. All sample transportation equipment and/or devices are provided and maintained by the contractor.

g. Post-exposure conditioning and determination of gross weights are conducted by the contract analytical laboratory in accordance with the laboratory's SOPs which must meet the requirements outlined in paragraph IV.I.2.b above.

h. Subsequent to determination of gross weights, the contract analytical laboratory stores all exposed filter elements under refrigeration at 4^oC for a period of one (1) year.

3. Cautions

a. Teflon filter elements are fragile. Handle with care, and never use damaged filter elements for sample collection.

b. $PM_{2.5}$ samples are subject to contamination which may affect analytical results. Field personnel should not handle filter elements directly, but only when loaded in filter cassettes. Care must be taken to prevent exposure to sources of particulate matter at all times other than sampling.

c. $PM_{2.5}$ samples are subject to loss of sample resulting from volatilization of certain chemical species and/or physical loss of particulate matter.

d. Sample loss due to volatilization is generally controlled by maintaining exposed filter elements at cool temperatures. Temperature control during handling and shipping is extremely difficult, but efforts to avoid exposure to elevated temperatures (i.e., above 4^oC) are essential.

e. Physical loss of particulate matter generally results from careless handling of exposed filter elements. This may result from dropping or jarring of cassettes as well as from abrasion of the filter element. Care should be taken to prevent accidental loss of particulate matter.

f. Cigarette smoke is a known source of fine particulate matter. All activities associated with filter handling, transport, and operation of PM2.5 airborne particulate samplers must be conducted in a smoke free environment.

4. Equipment

a. Rupprecht & Pataschnick Partisol-Plus Model 2025 Sequential Air Sampler

b. $PM_{2.5}$ Teflon filter elements 47mm in diameter. Each should be housed in an appropriate filter cassette.

c. Rupprecht & Pataschnick Palmtop Data Acquisition System (PDAS) or equivalent (e.g., HP 360LX or higher model number with Windows CE2.0 or higher version, appropriate connecting hardware, and appropriate R&P communications and data management software)

d. (Electro)static-free bags with labels for filter cassettes

e. Mini-cooler with reusable cooling medium and internal temperature monitoring device

f. Internal (secondary) container to hold and protect samples in mini-cooler.

g. Ball point pen

5. Sample Collection, Preservation and Storage

a. Collect and retrieve samples and associated data in accordance with paragraph IV.G above.

6. Sample Handling Procedure

a. EPA personnel provide unexposed 47 mm diameter Teflon filter elements to the contract analytical laboratory.

NOTE: Steps 6.b through and including 6.h (below) are performed by contract analytical laboratory personnel.

The primary KDHE/BAR contract specification requires that the contracting laboratory conduct all filter handling in accordance with 40 CFR 50, Appendix L, Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere. Whenever possible, the $PM_{2.5}$ filter elements are also handled in accordance with EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Sec.2.12. Deviations from Sec. 2.12 must be approved by KDHE/BAR per contract. All contract analytical laboratory activities are conducted in accordance with the laboratory's SOPs. These SOPs are subject to KDHE review.

b. Conduct physical inspection of filter elements. Do not use damaged or imperfect filters for sampling.

c. Properly identify each filter (i.e., assign filter I.D.).

d. Condition filter elements in preparation for determination of tare weights.

e. Determine tare weights of filter elements. This should be limited to an approximate number that can be exposed within thirty (30) days after weighing.

f. Perform all required Quality Assurance/Quality Control (QA/QC) activities.

g. Load processed (tared) filter elements into filter cassettes for handling and sampling.

h. Properly package processed filter elements, and ship them to KDHE/BAR and to local agencies conducting $PM_{2.5}$ sampling under Memoranda of Agreement with KDHE/BAR.

NOTE: Steps 6.i through and including 6.r (below) are performed by KDHE/BAR or local agency field. .

Filters must be exposed within thirty (30) days of determination of tare weight.

i. Install filters into samplers, loading magazine in accordance with the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual. Load appropriate filter/sample information into sampler memory at this time.

j. Initiate the sampler run to expose the filter element to a known volume of air for a designated length of time (usually 24 hours). Particulate matter is collected on the filter element.

k. Immediately prior to retrieval of filter elements, remove cooling medium from freezer. Place in mini-cooler with temperature monitoring devices. (Mini-cooler, cooling medium, and temperature monitoring devices are provided by the contract analytical laboratory.)

l. Retrieve filter elements (in cassettes) and associated data in accordance with the manufacturer's operating manual.

m. Place each filter cassette retrieved in a separate static-free bag (provided by the contractor). Each bag should be custody label-side up, with the sample surface toward the custody label on the bag to ensure that the sample is shipped with the exposed surface upward.

   <u>Always handle, transport, and/or store bagged samples custody label-side up.</u>

n. Write appropriate filter/sample information on the custody label attached to the bag.

o. Open mini-cooler, and place bags inside inner secondary container with custody label-side up. Close mini-cooler.

p. Transport mini-cooler to office after retrieval of all filter elements. If filters will not be shipped within two (2) hours, remove cooling medium and secondary container from coolers and place in freezer.

q. Prepare mini-cooler for shipping. Place sample data diskette in secondary container (containing samples), cooling medium, and temperature monitoring device in mini-cooler. Seal mini-cooler. Prepare and attach shipping label.

r. Ship mini-cooler(s) to contract laboratory via preferred carrier. (Preferred shipping is negotiated with the contract analytical laboratory at the start of each contract period.)

NOTE: Steps 6.s through and including 6.cc (below) are performed by contract analytical laboratory personnel.

s. Upon receipt, open each mini-cooler received and record the minimum and maximum shipping temperature from the enclosed temperature monitoring device(s), and log in each sample.

t. Condition exposed filter elements.

u. Remove exposed filter elements from cassettes.

v. Determine gross weights of the exposed filter elements.

w. Perform all required Quality Assurance/Quality Control (QA/QC) activities.

x. Calculate net weight (i.e., weight of fine particulate).

y. Ensure that all required Quality Assurance/Quality Control (QA/QC) activities have been performed.

z. Calculate results, ensure that data flags have been assigned, process data, and prepare reports.

aa. Transmit data in AIRS format to KDHE/BAR. This is to be performed at least once per month.

bb. Store samples at 4ºC for a period of at least one (1) year.

cc. Contact KDHE/BAR prior to discard of samples stored for more than one (1) year.

J. Laboratory Procedures

1. The KDHE contract analytical laboratory performs microgravimetric analysis according to the procedures specified in 40 CFR 50, Appendix L, Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere. The contractor also performs all procedures specified in EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Vol.

II, Sec.2.12, or equivalent, with the approval of the Bureau of Air and Radiation (KDHE/BAR).

2. The contract laboratory will follow applicable portions of paragraph IV.I above.

3. The contract laboratory will provide a QA Project Plan (QAPP) for approval by KDHE. The contract laboratory will follow their QAPP and applicable SOPs.

4. The contract laboratory will provide concentration data and flags if appropriate. A list of flags is shown in Appendix E below. It should be noted that these flags do not necessarily conform to EPA AIRS flags. Also, a flag does not necessarily indicate invalid data.

K. Receipt, Inspection and Acceptance of $PM_{2.5}$ Equipment

1. This procedure will describe the method for receipt, inspection , and acceptance of $PM_{2.5}$ equipment.

2. Summary of Method

a. The KDHE and local partner agency field technical staff are responsible for the receipt, inspection and acceptance of all $PM_{2.5}$ equipment.

b. Each Partisol-Plus Model 2025 sampler is assembled and prepared for operation in accordance with the "Quick Start Guide" provided by the manufacturer.

c. Each Partisol-Plus Model 2025 sampler is evaluated in accordance with the "Test and Acceptance Guide" provided by the manufacturer.

d. For samplers purchased under the National Contract for the Purchase of $PM_{2.5}$ Monitoring Equipment, an EPA "Testing and Acceptance Criteria" form will be completed. A copy of this form will be provided (e.g., FAXed) to the appropriate EPA Headquarters contact along with the Serial Number of each instrument being accepted.

e. Unless problems with a sampler are encountered, inspection and acceptance will be completed within 10 working days of receipt.

3. Health and Safety Warnings

a. General safety precautions related to electrical hazards must be observed at all times when working with electronic equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electronic equipment in wet conditions, as frequently encountered at field monitoring sites.

b. Persons operating the R&P Partisol-Plus Model 2025 Sequential Air Sampler or cleaning the WINS impactor should review the Material Safety Data Sheet (MSDS) for the WINS impactor oil.

c. General precautions for working with heavy equipment, and electro/mechanical equipment with moving parts should be taken.

4. Cautions

a. Although field equipment is manufactured to withstand environmental extremes, it is still precision equipment with relatively fragile electronic and mechanical parts. All field equipment used for environmental measurements should be handled with care.

5. Personnel Qualifications

a. Persons evaluating the operation of the R&P Partisol-Plus Model 2025 Sequential Air Sampler must be familiar with the operation of electro/mechanical equipment.

b. Computer skills are essential for programming the sampler and for problem diagnosis and troubleshooting.

c. Working familiarity with electronic and mechanical test equipment is required.

6. Equipment

a. Volt/Ohm test meter (VOM)

b. Laptop computer

c. Hand tools

d. Barometer & thermometer standards

e. R&P "Test and Acceptance Guide"

7. Testing and Acceptance Procedure

a. At the time of delivery, sign appropriate freight documentation to acknowledge receipt.

b. Transport equipment to an appropriate secure holding area, or take directly to the Air Monitoring Services Section shop.

c. Carefully unpack each shipping container, and inspect the contents for damage and/or missing parts/items.

d. Assemble each R&P Partisol-Plus Model 2025 Sequential Air Sampler, and prepare it for operation in accordance with the "Quick Start Guide" provided by the manufacturer.

e. Conduct acceptance testing for each Partisol-Plus Model 2025 sampler in accordance with the "Test and Acceptance Guide" provided by the manufacturer.

f. For each sampler, complete and initial a copy of the "Test & Acceptance Guide" identified by the sampler serial number. Document values and pass/fail for external and internal leak checks on the back of the guide. Also document any minor repairs or adjustments made during the acceptance phase.

g. Evaluate problems with individual samplers as they occur, and take appropriate corrective actions or perform repairs as required in accordance with the R&P Partisol-Plus Model 2025 Sequential Air Sampler Operating and/or Service Manual. Report delays in acceptance to the Ambient Air Analysis Unit Supervisor. For samplers purchased under the National Contract for the Purchase of $PM_{2.5}$ Monitoring Equipment, the supervisor relays relevant information to the EPA Headquarters contact. If a specific problem is not readily solved, KDHE and/or local partner agency technical staff contact the manufacturer (R&P) for technical assistance.

h. When all steps in the "Test and Acceptance Guide" have been successfully completed, forward the information to the Ambient Air Analysis Unit Supervisor. For samplers purchased under the National Contract for the Purchase of $PM_{2.5}$ Monitoring Equipment, an EPA "Testing and Acceptance Criteria" form (see below) must be completed. A copy of this form will be provided (e.g., FAXed) to the appropriate EPA Headquarters contact along with the Serial Number of each sampler being accepted.

i. The EPA "Testing and Acceptance Criteria" form appears in Appendix D below.

V. Quality Control

A. The operator will run one (1) field blank for each ten (10) exposed filters sent to the contract analytical laboratory.

B. Replicate weighings and laboratory blanks are required . The KDHE contract analytical laboratory performs all QA/QC procedures specified in 40 CFR 50, Appendix L, Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere. The contractor also performs all QA/QC procedures specified in EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Sec.2.12, or equivalent, with the approval of the Bureau of Air and Radiation (KDHE/BAR).

C. KDHE conducts an annual inspection and audit of the analytical laboratory performing microgravimetric analysis of $PM_{2.5}$ samples collected within the Kansas Ambient Air Monitoring Network.

1. Scope and Application

a. Microgravimetric analysis of $PM_{2.5}$ filter elements from samplers operating in the Kansas Ambient Air Monitoring Network is performed by a laboratory under contract with the Kansas Department of Health and Environment (KDHE). The contract specifically provides for one (1) KDHE Bureau of Air and Radiation (KDHE/BAR) employee to perform one (1) site visit during each year of the life of the contract with expenses for travel, lodging, and per diem covered by the contractor. The purpose of this annual site visit is to provide an opportunity to conduct an inspection/audit for evaluation of overall laboratory performance of work as specified in the contract. Additional inspections/audits at KDHE expense are not precluded, and the United States Environmental Protection Agency (EPA) may also conduct similar activities independent of KDHE.

b. The contractor is to conduct analysis of $PM_{2.5}$ filter elements in accordance with EPA's regulatory requirements (contained in 40 CFR 50, Appendix L) and section 2.12 of volume II of EPA's Quality

Assurance Handbook for Air Pollution Measurement Systems (or equivalent procedures if approved by KDHE/BAR). This inspection/audit is intended to assure that the contract laboratory complies with this primary contractual specification.

2. Summary of Method

a. The contractor is notified of the impending inspection by telephone, a date is agreed upon, and the date is confirmed in writing.

b. Round-trip travel arrangements are made.

c. Subsequent to arrival at the laboratory, an initial interview is conducted with appropriate laboratory management and staff personnel to explain the reason for the visit and outline the inspection/audit process.

d. The inspection and audit are conducted. The “Checklist for Inspection and Audit of Contract Laboratory for Microgravimetric Analysis of $PM_{2.5}$ Filter Elements” (Appendix B below) is completed on site during the course of the inspection/audit. Open communication with laboratory staff during these activities is essential.

e. An exit interview is conducted, and a preliminary summary of findings is presented to laboratory management personnel by the inspector.

f. A summary of findings and recommendations for any necessary corrective actions are included in a report.

g. A copy of the report is sent to appropriate contract laboratory management personnel. Written documentation of corrective actions taken by the laboratory is requested.

h. Written documentation of corrective actions is provided to KDHE/BAR by the contract laboratory.

3. Health and Safety Warnings

a. Laboratory safety practices which minimize exposure to various chemical, electrical, and other hazards are warranted.

4. Cautions

   a. The inspector will be accompanied by laboratory personnel during the inspection.

   b. Open two-way communication is essential.

5. Personnel Qualifications

   a. The inspector will have a basic understanding of quality assurance and quality control (QA/QC) as applied in an analytical laboratory.

   b. Work experience and/or training in analytical laboratory procedures will be helpful.

6. Equipment

   a. Clipboard

   b. Ballpoint Pen

   c. "Checklist for Inspection and Audit of Contract Laboratory for Microgravimetric Analysis of $PM_{2.5}$ Filter Elements" (Appendix B below)

   d. Notepad

   e. 200mg audit weight (Class I, NIST-traceable; provided by KDHE. This will be used as an independent check in evaluating microgravimetric balance performance.)

7. Inspection and Audit Procedure

   a. Contact the appropriate contract laboratory personnel by telephone and establish a tentative date for the inspection and audit.

   b. Follow up by mail with a written notification confirming the date of the inspection and audit.

   c. Make round-trip travel arrangements.

   d. At least five (5) days prior to the laboratory visit, reconfirm the date by telephone or Email.

e. Upon arrival at the laboratory facility, conduct an initial interview with appropriate management and staff (technical and clerical) personnel. Brief them concerning the reason for the visit, and explain the inspection/audit process.

f. Conduct the inspection and audit using the "Checklist for Inspection and Audit of Contract Laboratory for Microgravimetric Analysis of $PM_{2.5}$ Filter Elements" (Appendix B below). Maintain open communication with all appropriate laboratory personnel. During the inspection/audit, make detailed notes to accompany the checklist.

g. The checklist will provide the structure for the course of the inspection and audit. The following are to be evaluated:

(1) Analytical facility and weighing room

(2) Microgravimetric balance performance

(3) Microgravimetric balance maintenance

(4) Filter conditioning

(5) Filter handling

(6) Filter weighing

(7) Record keeping and calculations

(8) Laboratory Quality Assurance Plan

h. Conduct an exit interview with appropriate laboratory management personnel. Present a preliminary summary of findings. The checklist will be signed by both parties (i.e., the inspector and the appropriate laboratory manager). Present laboratory management with a copy of the signed checklist.

i. Upon return from the inspection/audit trip, review the checklist and additional notes taken during the laboratory inspection/audit.

j. Prepare a written report containing a summary of findings and recommendations for corrective actions for deficiencies noted.

k. Mail a copy of the report with a cover letter to appropriate laboratory management personnel. In the cover letter, be sure to establish a time frame for correction of noted deficiencies and request written documentation of corrective actions taken by the laboratory.

l. Review the documentation of corrective actions provided by laboratory management.

m. If deficiencies are not addressed or appear to persist, address relevant issues in writing, and request additional documentation. (Resolution of severe deficiencies may necessitate another laboratory visit. Because of the contractual agreement, payment for expenses may have to be negotiated.)

n. Upon approval of laboratory performance, send a letter to appropriate laboratory management personnel.

o. A copy of the inspection and audit report and copies of all relevant correspondence are to be reviewed and filed by the Bureau Quality Assurance Representative.

p. The “Checklist for Inspection and Audit of Contract Laboratory for Microgravimetric Analysis of $PM_{2.5}$ Filter Elements” appears in Appendix B below.

D. At least 25% of the sites will have a collocated samplers. The official sampler is designated the primary sampler and the non-official sampler is designated the duplicate sampler. The collocated samplers will be located within 1 to 4 meters of each other. The collocated samplers will be sited and operated according to 40 CFR 58 Appendix A, Section 3.5.2.

E. Audits will be performed by KDHE on each sampler in each calendar quarter. The procedure in paragraph III.C.9 (above) will be followed in these audits.

VI. Preparation and Analyzing Samples in the Field

See paragraph IV (Sampling Operations) above.

VII. Transport, Transferring and Storing Samples

A. Chain-of-Custody

1. These filter elements are quite fragile, and $PM_{2.5}$ samples must be protected

from contamination and/or analyte loss which may affect analytical results. Special handling is required to ensure the integrity of these samples.

2. The bag custody label is used to document the filter ID, the cassette ID, the expiration date, the site ID, the sampler ID, the sample date, the sample volume, sampling elapsed time, status, and comments.

3. Cautions

   a. Damage to the $PM_{2.5}$ sampler may result if caution is not taken to properly install and maintain the device. Follow the manufacturer's instructions for maintenance of the sampler and for handling of Teflon filter elements.

   b. Teflon filter elements are fragile. Handle with care, and never use damaged filter elements for sample collection.

   c. $PM_{2.5}$ samples are subject to contamination which may affect analytical results. Field personnel should not handle filter elements directly, but only when loaded in filter cassettes. Care must be taken to prevent exposure to sources of particulate matter at all times other than sampling.

   d. $PM_{2.5}$ samples are subject to loss of sample resulting from volatilization of certain chemical species; and/or physical loss of particulate matter. Sample loss due to volatilization is generally controlled by maintaining exposed filter elements at cool temperatures. Temperature control during handling and shipping is extremely difficult, but exposure to elevated temperatures should be avoided. Physical loss of particulate matter generally results from careless handling of exposed filter elements. This may result from dropping or jarring of cassettes as well as from abrasion of the filter element. Care should be taken to prevent accidental loss of particulate matter.

   e. Cigarette smoke is a known source of fine particulate matter. All activities associated with filter handling, transport, and operation of PM2.5 airborne particulate samplers must be conducted in a smoke free environment.

4. Equipment

   a. Rupprecht & Pataschnick Partisol-Plus Model 2025 Sequential Air

Sampler

b. $PM_{2.5}$ Teflon filter elements 47mm in diameter. Each should be housed in an appropriate filter cassette.

c. Rupprecht & Pataschnick Palmtop Data Acquisition System (PDAS) or equivalent (e.g., HP 360LX or higher model number with Windows CE2.0 or higher version, appropriate connecting hardware, and appropriate R&P communications and data management software)

d. (Electro)static-free bags with labels for filter cassettes

e. Mini-cooler with reusable cooling medium and internal temperature monitoring device

f. Internal (secondary) container to hold and protect samples in mini-cooler.

g. Ball point pen

5. Custody Procedure

a. A clean (preweighed) batch of filters is received from the contracting laboratory. A packing list is enclosed. The packing list has the contracting laboratory address, the name of the contact person at the operator's agency, the shipping date, the number of filters, and the ID number of each filter.

b. Each clean filter (in its cassette) is in a plastic bag. The plastic bag has a custody label affixed to it. The filter ID number, the cassette ID number, and the filter expiration date ("use before" date) have already been entered on the bag custody label by the contracting laboratory.

c. The operator assigns each filter to a sampler, run date and whether or not it is a blank. The operator enters in a log the sampler ID, filter ID, cassette ID, blank or not, and the planned run date.

d. In the remaining portion of this procedure, take the actions stipulated according to the operator's manual. The filters (in their cassettes) are put into a filter cassette magazine so that they will run in order of the log entries above. Attach this magazine to the left-hand (supply) side of the monitor. For each filter added to the magazine, enter filter ID, blank or not, and cassette ID into the monitor to match the log entries above.

e. After the monitor has sampled, the operator downloads data from the monitor. When picking up the filters, the operator verifies that the filters in the right-hand (storage) filter cassette magazine match the log entries above or the downloaded data.

f. Using the log, and/or the monitor screens, and/or the downloaded data, the operator fills in the following on the bag custody label: site ID, sampler ID, sample date, sample volume, sampling elapsed time, status, and comments (if any). Put each filter (in its cassette) in the appropriate plastic bag (with custody labels affixed to the bags).

g. The operator records the pickup date and any comments in the log.

h. The operator mails in the filters every two weeks as desired by the contracting laboratory.

B. Further instructions to be followed are found in paragraph IV.I above.

VIII. Data Acquisition and Processing

The procedure in paragraph IV.A of Section 4 (above), will be followed.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

See these paragraphs of Section 9 of this document: III.A.2, III.B.2, III.C.6, IV.E, IV.H.3, IV.I.4, IV.K.6, V.C.6, and VII.A.4.

Section 10

CERTIFICATION OF STANDARDS

I. Overview

This section describes procedures for the certification of standards. These standards are used for calibrating and auditing air monitors. These standards are in the form of gaseous standards and flow standards. Gaseous standards are in the form of cylinders of gas, permeation tubes, and ozone photometers. Flow standards are in the form of PM10/TSP orifice calibration standards and PM2.5 Streamline Flow Transfer Standards.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

A. Certification of Gases

1. Zero-air

a. For SO_2, NO_2, O_3, zero-air is provided by a pressurized ozoneated charcoal scrubber.
b. For SO_2, activated charcoal is an option to provide zero-air.
c. For CO, two methods are allowed: a catalytic oxidizer or bottled zero gas.

2. Pollutant Gases

For continuous analyzers, standard pollutant gases utilized for calibrations, span checks, precision checks, and performance audits must be traceable to National Institute of Standards and Technology (NIST) gaseous Standard Reference Materials (SRM) or Traceable Reference Materials (NTRM). The certification of cylinders of gas are performed by the manufacturer according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards 1997 (EPA Protocol Gases).

a. CO Certification

CO (balance air) cylinders are purchased as EPA Protocol Gases.

Note: CO cylinders will have the non-CO portion of the gas mixture be air.

b. NO_2 Certification

The NO cylinders and NO2 permeation tubes are purchased as EPA Protocol Gases.
In a QC procedure in which an NO cylinder is used, the known NO_2 is established by Gas Phase Titration (GPT) in the following manner: A span check is performed on the NO channel. After this is complete, ozone is then mixed with the NO from the cylinder, this causes NO_2 to be produced ($NO+O_3 = NO_2+O_2$). The difference between the NO monitor readings before and after this mixing is used as the concentration of NO_2 produced.

c. O_3 Transfer Standard Certification

At least every 12 months, the KDHE primary standard photometer is compared with the EPA Region VII primary standard photometer. The KDHE primary standard is then kept in the shop. Transfer standard photometers are periodically compared with the KDHE primary standard. One transfer standard is used for audits; the other is used for non-audit QC operations. When a transfer standard is used, it has been compared with the primary standard within the previous three months. All of these comparisons are done by using at least three calibration points. A record of all of these comparisons are kept on file.

d. SO_2 Certification

All SO_2 cylinders and SO_2 permeation tubes are purchased as EPA Protocol Gases.

e. H_2S Certification

The permeation rates of the H_2S permeation tubes are certified traceable to NIST standards by gravimetric analysis.

C. HiVol Orifice Calibration Unit Certification

1. Purpose

TSP and PM_{10} Flow Certification: Each orifice calibration unit shall be calibrated against a positive displacement meter (e.g., a Roots meter) every 12 months. USEPA Region 7's Roots meter in Kansas City, KS is used for this purpose.

2. Frequency of Certification

Orifice calibration units are certified at approximate twelve (12) month intervals.

3. Equipment

a. Orifice calibration unit

b. Roots meter

c. Connectors

4. Certification Procedure

a. Connect the orifice to the inlet of the Roots meter. Connect a HiVol to the outlet side of the Roots meter.

b. Check for leaks by temporarily clamping both manometer lines (to avoid fluid loss) and blocking the orifice. Start the HiVol and note any change in the Roots meter reading. The reading should remain constant. If the reading changes, locate any leaks by listening for a whistling sound and/or retightening all connections, making sure that all gaskets are properly installed.

c. Turn off the HiVol. Unblock the orifice. Unclamp both manometer lines and zero both manometers.

d. Record the date, the orifice ID, the person's name doing the calibration, and the Roots meter ID on the orifice calibration form. Record the room temperature in degrees Celsius. Record the barometric pressure (P) in millimeters of Mercury (Hg).

Calculate T = degrees C + 273.
Calculate F = (P/760) * (298/T). Record T and F on the orifice calibration form.

e. Achieve five different but constant flow rates, evenly distributed, over the range of 33 to 68 CFM.

f. Repeat steps g. through p. below for each flow rate. Allow the system to run for at least one minute in order for a constant motor speed to be attained.

g. Simultaneously read the Roots meter reading and start a stop watch. Record the Roots meter reading at the start of the stop watch as VI.

h. While the air is still flowing, read and record the Roots meter inlet pressure manometer in inches of Hg as PI.

i. While the air is still flowing, read and record the orifice manometer reading in inches of water as H.

j. After at least 200 cubic feet of air have passed through the Roots meter at a constant rate, simultaneously read the Roots meter reading and stop the stop watch. Record the Roots meter reading when the stop watch was stopped as VF.

k. Calculate and record VM = VF - VI.

l. Record the elapsed time from the stop watch in hundredths of a minute as TE.

m. Record PR = PI * 25.4.

n. Record VS = VM * ((P-PR)/760) * (298/T).

o. Record QS = VS / TE.

p. Record square root (H * F).

q. Plot as a straight line, square root (H * F) versus QS.

r. Or using Quattro Pro, run a regression with the independent variable being the square root of (H * F) and the dependent variable being QS. Using the resulting slope and intercept, build a table of (H*F) and the corresponding QS.

s. Each orifice will be calibrated once per year.

D. The Streamline Flow Transfer Standard

The Streamline Flow Transfer Standard (FTS) is sent to the manufacturer for recertification. The FTS is used in the field to calibrate PM2.5 intermittent monitors.

E. Calibration of the Barometric Pressure Transfer Standard (BPTS)

1. Purpose

The BPTS is an aneroid barometer that is used in the field for PM2.5 intermittent monitor pressure sensor calibration. The BPTS is also used during PM10/TSP intermittent monitor flow calibrations and audits. The following procedure is used to calibrate the BPTS.

2. Summary of Method

a. KDHE maintains a National Institute of Standards and Technology (NIST)- traceable aneroid barometer as the authoritative standard (i.e., reference barometer). Readings on this instrument are corrected for elevation to the nearest known foot (in relation to the nearest United States Geological Survey benchmark).

b. The reference barometer is visually inspected before a transfer standard is compared to it.

c. A single point pressure verification / calibration is performed annually. All verification checks are maintained in a log, and results are provided to the QA Officer.

d. A multipoint pressure verification/calibration will be performed:

(1) On new transfer standards;
(2) when a transfer standard differs from the reference standard by more than $\pm$3 mm Hg during a single point verification;
(3) when a transfer standard has been dropped, or other damage is suspected; and/or
(4) if a transfer standard has been modified or repaired.

3. Cautions

a. Barometers are sensitive to sudden temperature changes. Allow the temperature of the barometer to equilibrate before making a comparison reading.

b. Always read an aneroid barometer when it is in the same position (i.e., horizontal or vertical) as when it was calibrated.

4. Personnel Qualifications

   a. Persons conducting pressure verification or calibration must be trained in the use of the specific apparatus required.

   b. Persons qualified to perform pressure verification or calibration must be familiar with common methods for the determination of barometric pressure.

5. Equipment

   a. Reference (aneroid) barometer

   b. Transfer standard barometer(s)

   c. Log book for verification data

   d. Calibration form

   e. Clipboard and pen

   f. Reference barometer correction and conversion data tables

   g. Pressure calibration chamber

6. Single Point Barometric Pressure Transfer Standard Verification Procedure

   a. Inspect the reference barometer for physical damage prior to use. Replace if damaged.

   b. Locate the transfer standard barometer next to the reference barometer.

   c. Allow time for temperature equilibration.

   d. Lightly tap the case of the aneroid barometers before reading.

   e. Read both barometers to the nearest 1mm Hg equivalent.

f. Note the offset, and correct field readings accordingly. If the offset exceeds ±3 mm Hg, perform a multi-point calibration.

7. Multi-point Barometric Pressure Transfer Standard Verification/Calibration Procedure

a. Inspect the reference barometer for physical damage prior to use. Replace if damaged.

b. Place the transfer standard barometer(s) and the reference barometer in the pressure calibration chamber in such a manner that all dials are clearly visible through the glass in the access door.

c. Tighten clamping screws to seal chamber access door.

d. Allow time for temperature equilibration.

e. Connect pressure/vacuum source to chamber port, and adjust pressure to approximately 740 mm Hg equivalent on reference barometer. Record pressure readings.

f. If the transfer barometer is adjustable, adjust to match the reference barometer.

g. Repeat procedure as necessary to achieve agreement with reference barometer within ±1 mm Hg. If transfer barometer is not adjustable, record pressure readings.

h. Connect pressure/vacuum source to chamber, and adjust pressure to approximately 690 mm Hg equivalent on reference barometer. Record pressure readings.

i. Repeat step h above for pressures of 715, 760, and 780 mm Hg. Record pressure readings.

j. Compute a best fit curve for the transfer standard barometer. Transfer standard barometers exhibiting a non-linear relationship or a difference of more than ±5 mm Hg for any point will be repaired or replaced.

8. Safety note

General safety precautions related to the handling and use of compressed gases must be observed during the calibration and QC procedures for continuous analyzers. Never attempt to use the contents of a compressed gas cylinder without an appropriate pressure regulator. Do not remove valve protector cap until ready to make connections. Keep valve pointed away from yourself and anyone else. Vent valve briefly to clear opening of dirt and debris before making connection. Never hammer on a cylinder valve or use excessive force in opening or closing. After making connections, check for leaks with soapy water. Close cylinder valve and release all pressure from a device before disconnecting. Never apply oil to a compressed gas valve or regulator. Never expose a compressed gas cylinder to a temperature above 125^o F. Vent and use compressed gases only with adequate ventilation.

F. Calibration of the Temperature Transfer Standard (TTS)

1. Purpose

The TTS is a minthermometer that is used in the field for PM2.5 intermittent monitor temperature sensor calibration. The TTS is also used during PM10/TSP intermittent monitor flow calibrations and audits. The following procedure is used to calibrate the TTS.

2. Summary of Method

a. National Institute of Standards and Technology (NIST)-traceable minithermometers are maintained as temperature transfer standards.

b. The reference minithermometers are visually inspected before comparison with a sampler sensor (see AAM SOP Section 19).

3. Health and Safety Warnings

a. General safety precautions related to electrical hazards must be observed at all times when working with electronic equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electronic equipment in wet conditions, as frequently encountered at field monitoring sites.

b. The electronic minithermometer probe is sharp. Use care in handling and transporting. Keep the minithermometer in its carrying case except when in use.

c. In order to minimize exposure to hazardous chemicals, no temperature standards or devices containing mercury will be used.

4. Cautions

   a. The electronic mimithermometer standard has a sharp probe. Use caution in transporting and handling.

   b. The minithermometer is a precision electronic instrument. Do not drop. Handle with care.

5. Personnel Qualifications

   a. Persons conducting temperature verification or calibration must be trained in the use of the specific apparatus required.

   b. Persons qualified to perform temperature verification or calibration must be familiar with common methods for the determination of temperature.

6. Equipment

   NIST-traceable minithermometer

7. Temperature Transfer Standard Calibration Procedure

   a. The calibration has been performed by or for the manufacturer of each minithermometer.

   b. The operator or supervisor maintains a copy of certification of NIST-traceability for each minithermometer used.

   c. Inspect each minithermometer for physical damage prior to use for comparison to temperature sensors.

   d. Replace any minithermometer which has been damaged.

G. Perform troubleshooting actions according to the applicable manufacturer's manual.

IV. Collection of Data Including Operating Procedures

This is not applicable because there is no sampling involved. Procedures for certification are described in paragraph III above.

V. Quality Control Sampling

This is not applicable because there is no sampling involved.

VI. Preparation and Analyzing Samples in the Field

This is not applicable because there is no sampling involved.

VII. Transporting, Transferring, and Storing Samples

All certifications performed in-house are documented by recording the date, the person, person's initials, the standard ID, the primary standard ID, the standard readings, and the primary standard readings. Outside-house certifications are documented by a certificate from the company performing the certification. In-house documentation is submitted to the Bureau QA Representative for filing. Outside-house certifications are filed by the operator or his/her supervisor.

VIII. Data Acquisition and Processing

Paper records of certifications are filed by the Bureau QA Representative, the operator, or the operator's supervisor.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

See paragraphs III.C.3, III.E.5, and III.F.6 above.

Section 11

OPERATION OF MIRAN-IA

I. Overview

This procedure describes the calibration and performance audit procedures for the Miran-IA portable infrared spectrophotometer.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

A. Miran-IA Calibration

1. A separate calibration is performed for each pollutant to be measured. Recalibrate if the wavelength filter is replaced or a new cell is installed.

2. Set up the Miran in a closed-loop calibration system developed by Foxboro-Wilks. Use a stainless steel bellows pump, septum, stainless steel fittings and polytetrafluoroethylene (PTFE) connecting tubes.

3. The calibration is performed by injecting known volumes of the sample through the septum.

4. Use the following formula to calculate the known concentration in parts per million (ppm):

$$C = \frac{rV}{M} \frac{RT}{P} \frac{10^3}{5.64}$$

Where:

V = Sample volume in microliters

r = Liquid density (g/cm^3)

M = Molecular weight of sample

R = .082

T - Temperature in degrees Kelvin (OC = 273K)

P = Pressure in atmospheres (1 atmos = 760 mm)

For Gases:

$$C = \frac{V}{5.64}$$

Where:

V = Sample volume in microliters

5. If the Miran-1A has been moved, or has been unused for several weeks, it is good practice to first calibrate the pathlength settings according to the procedure in the operator's manual. Then subsequently use the OSHA Wall Chart to determine the absorbance, wavelength and pathlength for the component of interest. Set the SLIT width to 1 mm, and optimize the pathlength and wavelength settings.

6. Flush the system with clean air to zero gas.

7. Calculate the injection quantity needed to give an upscale meter deflection of 50-70% on the selected absorbance scale. Inject the calculated quantity into the pump septum. Inject liquid standards slowly to allow complete vaporization.

8. After 30-60 seconds, when the absorbance has stabilized, turn off the calibration pump and SCAN the spectrum between 2.5 and 14.5 micrometers. Locate the strongest absorption wavelength, carefully rocking the dial to determine the maximum absorbance. This wavelength should be used in the following calibration. If known interferences could be encountered during the study, an alternative wavelength may be used.

9. Flush the system with clean air or zero gas. Set the wavelength setting as determined from Step 8.

10. Calculate the injection standard needed to give an absorbance response of

approximately 10% of full scale meter reading. Carefully inject standard and record the injection volume.

11. Using the total volume injected into the system, calculate the concentration in ppm according to the formula in Step 4 above.

12. Read the stabilized absorbance value at this concentration. This absorbance is the Y-value of the calibration plot.

13. Plot the X and Y points from Step 11 and 12 above. Record the concentration (X) and absorbance (Y).

14. When you have plotted at least 5 calibration points, skip to Step 17, otherwise continue with Step 15.

15. Inject an additional measured volume of sample into the system.

16. Return to Step 11 above.

17. Connect the plotted points from Step 13 with a smooth curve.

18. Record the type of pollutant and whether the injections were liquid or gas.

19. Record the wavelength, pathlength, slit width, and absorbance range settings.

20. Record your name, the date, and the Miran serial number.

21. Record the ambient pressure and temperature.

22. Record the molecular weight and density of the liquid injected.

B. Troubleshooting will be done according to the instructions in the manufacturer's operating manual.

IV. Collection of Data Including Operating Procedures

The instructions for operation and maintenance in the manufacturer's operating manual will be followed.

V. Quality Control Sampling

A. <u>Miran-IA Audit</u>

1. The performance of this audit is optional to the operator.

2. Set up the Miran in a closed-loop calibration system developed by Foxboro/Wilks.

3. Obtain the last calibration record for this pollutant.

4. Set the Miran to the wavelength, pathlength, slit width, and absorbance range as indicated from the calibration record.

5. Flush the system with clean air or zero gas.

6. Inject the same volumes of pollutant that were injected for the calibration.

7. For each injection, read and record the stabilized absorbance value.

8. Record your name, the date, serial number, pollutant, wavelength, pathlength, slit width, absorbance, and whether the injections were liquid or gas.

9. For each injection, record the volume, the calculated concentration in ppm, and the absorbance.

10. Plot the concentrations versus absorbances.

11. For each audit point, calculate the percent difference between the audit absorbance and absorbance from the calibration curve. Record these percent differences.

12. Record the ambient pressure and temperature.

VI. Preparation and Analyzing Samples in the Field

See paragraph IV above.

VII. Transport, Transferring, and Storing Samples

See paragraph IV above.

VIII. Data Acquisition and Processing

Either hard copy or electronic spreadsheets are maintained with data results.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

Miran-IA analyzer, stainless steel bellows pump, septum, stainless steel fittings, polytetrafluoroethylene (PTFE) connecting tubes, and a standard of known concentration.

Section 12

OPERATION OF ORGANIC VAPOR ANALYZER-128

I. Overview

This procedure describes the operation, calibration, and performance audit procedures for the Organic Vapor Analyzer-128 gas chromatograph.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

A. Organic Vapor Analyzer-128 Calibration

1. Obtain a 5 gallon glass bottle and determine its exact volume.

2. For gaseous injections:

Concentration (PPM) = injection (microliters) / volume bottle (liters)

For liquid injections:

$$C = \frac{r\ V}{M} \quad \frac{RT}{P} \quad \frac{1000}{V2}$$

Where:

C = concentration in PPM
V = injection volume in microliters
V2 = glass bottle volume in liters
r = injected liquid density in g/cm^3
M = molecular weight of injected liquid
R = .082
T = temperature in degrees Kelvin (degrees C + 273)
P = pressure in atmospheres (mmHg / 760)

3. Place a one-foot piece of plastic tubing in the bottle to aid in mixing the vapors. In the following calibrations, the known concentrations are taken from this bottle.

4. Connect the chart recorder to the Organic Vapor Analyzer (OVA).

5. Inject a known concentration (using Steps 1-3 above) into the gas chromatograph (GC) system.

6. Record the retention time and the resulting chromatogram peak height. The peak height may be scaled from the chart or the OVA readout meter may be observed during the evaluation of the peak.

7. Repeat Steps 5 and 6 above for up to 8 different organics.

8. Prepare a sample containing all of the organics from above in amounts of 100 ppm of each.

9. Inject this sample into the GC system.

10. Using the resulting chart, plot the known concentrations (PPM) versus the instrument reading (PPM) for each organic.

11. Record the retention times of each organic.

12. Record the OVA model number and serial number, the column type and serial number, temperature, the carrier flow rate, the amount of injection, type of injection receiver (for example, Valve), the date, the threshold limit for each organic, the % relative response, the chart speed, range setting, vertical recorder scaling (ppm/inch), and the total response.

B. Troubleshooting will be done according to the instructions in the manufacturer's operating manual.

IV. Collection of Data Including Operating Procedures

The instructions for operation and maintenance in the manufacturer's operating manual will be followed.

V. Quality Control Sampling

A. Organic Vapor Analyzer-128 Audit

1. The performance of this audit is optional to the operator. Connect the chart recorder to the Organic Vapor Analyzer (OVA).

2. Use the first 3 steps of III.A above (Organic Vapor Analyzer-128 Calibration) in order to achieve known concentrations.

3. Obtain the record of the calibration of the group of organics you are auditing.

4. On a blank calibration form put AUDIT at the top of the form.

5. Fill in the compound names duplicating those names from the calibration record.

6. Prepare a sample containing 100 PPM of each compound.

7. Inject this sample into the GC system.

8. Using the instrument reading or the resulting chart, read and record each compound's raw concentration.

9. Using the calibration curves, convert the raw concentrations to measured concentrations.

10. Calculate the percent difference between the measure concentrations and the known concentrations.

11. Record the percent differences on the audit form.

12. Record the OVA model number and serial number, the column type and serial number, temperature, carrier flow rate, amount of injection, type of injection receiver (for example, valve), the date, the threshold limit for each organic, the percent relative response, the chart speed, range setting, vertical recorder scaling (PPM/inch), and the total response.

VI. Preparation and Analyzing Samples in the Field

See paragraph IV above.

VII. Transport, Transferring, and Storing Samples

See paragraph IV above.

VIII. Data Acquisition and Processing

Either hard copy or electronic spreadsheets are maintained with data results.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

Organic Vapor Analyzer-128, 5 gallon glass bottle, one-foot piece of plastic tubing, and standards of known concentration.

Section 13

OZONE MAPPING SYSTEM

I. Overview

Ground-level ozone, a major component of smog, can exhibit an adverse impact on human respiratory health. People who live in communities which have a potential for elevated ozone levels can use timely, accurate information to make informed personal decisions concerning protection of their health and to know when to take actions to reduce local ozone levels.

The United States Environmental Protection Agency (U.S. EPA) created the Environmental Monitoring for Public Access and Community Tracking (EMPACT) program to utilize new technologies to provide environmental information to the general public in near real-time. One of the largest EMPACT projects is the Ozone Mapping Project, which utilizes frequently updated monitoring data to generate maps that provide communities with current information about ozone pollution in an easy-to-understand, color-coded format. These maps are created from hourly ozone data gathered from ozone monitoring networks across the country, and their color-coded contours indicate the relative level of health concern based upon the current ozone concentrations.

This procedure is to be used by Air Monitoring Services personnel to poll data loggers and transfer resultant continuous ozone data to the AIRNOW website maintained by the United States Environmental Protection Agency (EPA): http://www.epa.gov/airnow/ . This SOP is intended to be used for procedural guidance and is not intended to supercede equipment manufacturer's manuals or procedures.

II. Technical Qualifications

A. Computer skills are required for transfer and management of data.

B. Experience in remote data transfer via modem is required.

C. Familiarity with Environmental Systems Corporation (ESC) software is required.

D. Ozone Mapping System (OMS) data management/processing personnel must have AIRNOW upload access.

E. The data management/processing trainee is required to read the following:

1. Ambient Air Monitoring Criteria Pollutants Monitoring Program Quality Assurance Program Plan in Kansas, Kansas Department of Health and Environment, Division of Environment, Bureau of Air and Radiation, Air Monitoring Services Section, Topeka, KS;

2. ESC Ozone Mapping System User's Manual, May 1998;

3. E-DAS Ambient for Windows Reference Manual, Version 5.33a, October 1999; and

4. Other applicable printed materials as available.

F. The data management/processing trainee observes an experienced trainer perform the data processing procedures. The trainee is encouraged to ask any questions that may arise.

G. The trainee performs the procedures while under the observation of an experienced trainer. The trainer offers constructive criticism in regard to the trainee's performance.

H. The trainee continues to perform under observation until the trainer is satisfied that the trainee is following the correct procedures.

I. In addition, any accessible training courses provided by EPA are to be attended for continuing education.

III. Calibration and Troubleshooting

See Section 1 of the AAM SOP.

IV. Collection of Data Including Operating Procedures

See paragraph VIII below.

V. Quality Control Sampling

See Section 1 of the AAM SOP.

VI. Preparation and Analyzing Samples in the Field

This is not applicable.

VII. Transport, Transferring, and Storing Samples

Data is transmitted electronically. See paragraph VIII below.

VIII. Data Acquisition and Processing

A. Summary of Method

1. Data is retrieved in an electronic format from data loggers in the field through the use of telephone connections and modems.

2. Data loggers are polled via modem connection at scheduled times.

3. Hourly ozone values are transferred via modem connection to a central desktop computer.

4. Electronic data review is conducted on the desktop system.

5. Errors are corrected, or bad values are voided.

6. Accepted ozone values are transferred from the desktop system to the EPA AIRNOW website.

B. Data Processing Procedure

1. Although KDHE collects ozone data throughout the year, only data collected during the Kansas ozone season (April 1 through October 31) are submitted to the Ozone Mapping System (OMS). Refer to the E-DAS Ambient for Windows Reference Manual and ESC Ozone Mapping System User's Manual for a detailed description of software set-up and operation. Also, see Section 3 of the AAM SOP.

2. Schedule polling times for OMS sites. These are 7 a.m., 11 a.m., 1 p.m., 3 p.m., 5 p.m., 7 p.m., and 9 p.m. Central Standard Time (CST).

   a. Set the polling computer, which retrieves and stores the ozone data, to poll the appropriate ozone monitor(s) at two hour intervals, starting at 7 a.m.

   b. Set the transfer computer, which sends ozone data to the EPA AIRNOW website via the Data Collection Center (DCC), to transfer the data (after electronic review), at two hour intervals.

3. The Air Monitoring Services Section prepares the ozone data prior to submitting it to the AIRNOW website.

4. Air Monitoring Services Section field personnel flag data during instrument maintenance or calibration. Any data flagged with a “C” (calibration), “D” (disable), or “M” (maintenance) will not be included in averaged data.

5. Data flagged as indicated above is flagged “B” (bad) by the OMS. This data will not be accepted for posting to the AIRNOW website via the DCC.

   Automated QA/QC checks are performed at the DCC prior to generation of maps. Steps 6 through 14 below are beyond the control of the Air Monitoring Services Section.

6. Any sites reporting which are not in the DCC active reporting station file are not mapped.

7. Flags transmitted to the DCC are used if they conform to the standard data format (e.g., the “B” flag).

8. A check for missing hours of data is performed.

9. The DCC looks at two QA items and then compares them to the last five years of AIRS data. First it looks for the high value. If a recorded value is above the highest value in AIRS over the last five years for a particular site, then the data is in question and will not be mapped or the DCC will contact KDHE to confirm before it is mapped. Second, the computer looks at the rate of change between values. If the rate of change is greater than it has been over the last five years of AIRS data for the site in question it will not be mapped or the DCC will contact KDHE to confirm the data.

10. If a single hourly value is missing, a linear interpolation is performed between the preceding and following values to estimate the value for the missing hour.

11. A summary report listing all flags assigned by the program is generated.

12. Sites with >25% missing data are flagged.

13. Time zones are standardized.

14. A visual inspection of all maps is performed at the DCC prior to releasing the maps to the AIRNOW website.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

A. Data logger(s) connected to continuous ozone monitor(s)

B. Modems

C. Desktop personal computer (PC)

D. ESC E-DAS Ambient for Windows software

E. ESC OMS software module

F. Internet connection to AIRNOW

Section 14

ANALYZER/INSTRUMENT SELECTION, ACCEPTANCE, AND INSTALLATION

I. Overview

Analyzers, samplers, and instruments must meet certain criteria to be considered for purchase and ultimately utilized. This procedure is intended to define those criteria and provide guidance for final acceptance and installation.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

IV. Collection of Data Including Operating Procedures

A. Selection Criteria

1. All air monitoring data will be obtained through the use of reference or equivalent methods (REMs) for all pollutants having REMs designated by USEPA. REMs are defined in 40 CFR 50.1.

2. Continuous monitoring instrumentation shall conform to criteria contained in 40 CFR 58, Appendix C.

3. All instrument operators shall follow procedures outlined in specific manufacturers' operational manuals supplemented by AAM SOP.

B. Acceptance Criteria

1. Following unpacking and assembly of any new monitoring instrument, an initial calibration shall be performed to confirm that the instrument is operating properly.

2. Instrument performance characteristics such as response time, noise, short-term zero and span drift, and precision shall be measured during or subsequent to initial calibration.

3. Acceptance of the instrument shall be based upon results of these performance tests. Results will be compared to published instrument specifications if such exist.

C. Installation

1. Monitoring site selection shall be in accordance with the purpose of the monitoring. Siting criteria for instruments and/or instrument probes are contained in 40 CFR 58, Appendix E.

2. Specific instrument requirements (e.g., electrical service requirements) may limit site selection.

3. Once physical siting requirements have been accomodated, installation should be conducted in accordance with specific manufacturer's recommendations and instructions.

4. Following installation, the instrument shall be recalibrated prior to actual use. Required QC procedures shall then be performed on schedule.

D. PM2.5 Acceptance Criteria

Additional requirements for PM2.5 sequential intermittent samplers can be found in Section 9, paragraph IV.K above.

V. Quality Control Sampling

This is not applicable.

VI. Preparation and Analyzing Samples in the Field

This is not applicable.

VII. Transport, Transferring, and Storing Samples

This is not applicable.

VIII. Data Acquisition and Processing

This is not applicable.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

This is variable and depends on the situation.

Section 15

CORRECTIVE ACTION

I. Overview

This procedure is intended to provide guidance for action to be taken based upon unacceptable QC results.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

See paragraph IV below.

IV. Collection of Data Including Operating Procedures

A. Invalidation of Data

1. The operator of each monitor shall void any data when there is good reason to suspect that the data are inaccurate.

2. Data shall be invalidated by the Bureau QA Representataive based upon span checks according to the following rules:

a. If any span checks exceed 25 percent difference, then the data going back to the last valid span check will be invalidated.

b. If there are missing span checks (required every two weeks), apply the following rules when invalidating:

i. More than one span check missing, causes invalidation back to the good (less than or equal 15% difference) span check.
ii. A span check from 16-25% difference (with no recalibration), counts as missing.
iii. An audit with the span point less than or equal 15% difference, counts as a good span check.
iv. A good span check that is greater than 5 weeks after or before any other span checks does not validate any data.

v. A calibration with a span point less than or equal 15% difference, counts as a good span check.

3. Data may be invalidated by the Bureau QA Representataive based on audits or failure to adhere to the provisions of the QAPP and/or SOPs.

4. The Bureau QA Representative will maintain supporting documentation of invalidation.

B. Recalibration: Zero and span drift checks are performed regularly (at least every two (2) weeks) on continuous analyzers in order to determine whether recalibration is necessary. Interpretation of zero and span check results and corrective actions are detailed in AAM SOP Section 1 above.

1. When recalibration is required, potential operational problems must be investigated and required maintenance performed prior to recalibration.

2. Repeated calibration failures may necessitate removal of the instrument for diagnostic evaluation and repair.

C. Audit Failures: Results of annual performance audits are not used as sole criteria for data validation, because these audits are required only once per year for each analyzer. These audits, however, provide an indication of the accuracy of monitoring data.

1. The cause of any audit deviation of more than 15% from the actual value will be investigated.

2. Instrument maintenance, repair, and/or recalibration will be performed as indicated.

3. Causes for reporting errors (i.e., wrong units, decimal place, etc.) will be investigated, and procedures developed to minimize the recurrence of such errors.

D. Equipment/Instrument Malfunction: Any deficiency in equipment/instrument performance discovered in the course of routine operation or during quality control procedures must be noted on the appropriate maintenance log sheet. Within the manufacturer's guidelines, the defective equipment/instrument may be serviced in the field, returned to the shop for repair, or returned to the manufacturer for repair or replacement. If available, a back-up instrument shall be utilized during the interim to minimize loss of data.

Data obtained during a malfunction shall be evaluated in order to determine the effect of any malfunction on data quality. Affected data will be invalidated at the discretion of the Bureau QA Representative.

E. Staff Performance Problems: In the event that Air Monitoring Services Section staff exhibit(s) difficulty with a given procedure, additional training shall be provided. Modification of procedure(s) to facilitate execution may be beneficial.

F. PM2.5 Intermittent Sampler Problems

1. If audits or verifications exceed 4%, the sampler is investigated and corrected, then recalibrated.

2. If the flow rate exceeds ±5% for greater than 5 minutes, a W flag is assigned in AIRS.

3. If the flow rate exceeds ±10% for more than 1 minute, the data is invalid.

4. If the filter temperature exceeds the ambient temperature by more than 5°C for more than 30 minutes, an X flag is assigned in AIRS.

5. If the coefficient of variation of flow rate is greater than 2%, the data may be voided.

6. If the sample period is less than 23 hours or greater than 25 hours, the data is invalid. There is an exception: if the sample period is less than 23 hours and the concentration determined by dividing the net weight by the volume (in cubic meters), that would have resulted had the sampler run for 24 hours (this is usually close to 24 cubic meters), gives a concentration greater than 15.4 micrograms per cubic meter, then that concentration is submitted to AIRS with a Y flag. If this calculation yields 15.4 micrograms per cubic meter or less, then the data is invalid.

7. If the sampler runs on the wrong data, the data is valid. But the data does not count as valid when calculating percent completeness.

8. Any data affected by exceptional events (fires, construction, etc.) will be flagged according to the AIRS flags which are listed in the AIRS system.

9. If the sample is not collected from midnight to midnight (±1 hour), it is invalid.

10. If the lab analysis followed exposure by more than 10 days and the sample was exposed to temperatures greater than 4°C, than the data is flagged by the lab as HT, but it is valid.

11. If the lab analysis followed exposure by more than 30 days, than the data is flagged by the lab as HT, but it is valid.

12. If the sample period followed tare analysis by more than 30 days, the data is flagged by the lab as XT, but it is valid.

13. If the sample temperature exceeded 25°C after removal from the sampler, the data is flagged by the lab as ST, but it is valid.

14. If the sample is not removed from the sampler within 96 hours of the end of the end of the sample period, the data is flagged by the lab as SR, but it is valid.

15. If the associated lab blank mass change exceeds ±15 micrograms, the data is flagged by the lab as LB, but it is valid.

16. If the associated field blank mass change exceeds ±30 micrograms, the data is flagged by the lab as FB, but it is valid.

17. If the mean equilibration temperature prior to weighing is outside the range of 20°C to 23°C, the data is flagged by the lab as LC, but it is valid.

18. If the mean equilibration relative humidity prior to weighing is outside the range of 30% to 40%, the data is flagged by the lab as LC, but it is valid.

19. If the equilibration time prior to weighing is less than 24 hours for exposed samples, the data is flagged by the lab as EQ, this data is invalid.

20. If the working standard balance check is ±3 micrograms from the certified value, the data is flagged by the lab as BC, but it is valid.

21. If there is contamination (e.g., insects or debris) on the filter, the data is flagged by the lab as CN, this data is invalid.

22. If there is a sampler malfunction such that the sampler did not run, the data is flagged by the lab as MM, this data is invalid.

23. If the filter is damaged , the data is flagged by the lab as FD, this data is invalid.

24. If the filter had a negative mass gain, the data is flagged by the lab as NM, this data is invalid.

G. When a quality control (QC) action results in an indication of a problem, the following corrective action steps are taken:

1. A visual inspection of the monitor system is performed for any malfunctions that could cause errors. The QC and maintenance history of the monitor are examined. The recent data are examined to see if there are any unusual patterns. If any of these actions result in elucidating a problem, then the monitor is repaired accordingly or replaced.

2. Verify the accuracy of the standard. This includes inspecting the calibration or certification documentation of the standard, checking the previous results of the standard when compared to other monitors, and inspecting the standard equipment for malfunctions. If the standard is in error, then repair or replace it.

3. Audit the monitor using a different standard.

4. If nothing definitive has been found up to this point, then a multi-point calibration will be done on the monitor. Future results (data and QC) of the monitor will be watched closely.

5. In the case of collocated samples which have a discrepancy, have the laboratory check their data entry and/or reweigh the filters.

V. Quality Control Sampling

This is not applicable.

VI. Preparation and Analyzing Samples in the Field

This is not applicable.

VII. Transport, Transferring, and Storing Samples

This is not applicable.

VIII. Data Acquisition and Processing

This is not applicable.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

This is variable.

Section 16

CONTINUOUS PM_{10}/$PM_{2.5}$ MONITORING; TEOM 1400 SERIES

I. Overview

This section describes the procedures for the calibration, operation, and maintenance of a TEOM 1400 Series continuous PM_{10}/$PM_{2.5}$ monitor. Specific technical considerations and complete operating instructions are included in the operation manual provided by the manufacturer. The Tapered Element Oscillating Microbalance (TEOM) 1400 Series is manufactured by Rupprecht & Patashnick.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

A. Calibrations

1. Perform the flow controller calibration (software) every six months. Follow the instructions in Section 8.2 (Flow Controller Calibration (Software)) of the Operating Manual.

2. Perform the analog output calibration every 12 months shortly prior to the flow controller calibration (hardware) below. Follow the instructions in Section 8.3 (Procedures for Analog Calibration) of the Operating Manual.

3. Perform the flow controller calibration (hardware) every 12 months shortly after the analog output calibration above.

a. Follow the instructions in Section 8.4 (Flow Controller Calibration (Hardware)) of the Operating Manual.

b. Follow Section 8.4.1 of the Operating Manual if the unit has a Tylan Flow Controller or Section 8.4.2 if the unit has a Brooks Flow Controller.

B. Troubleshooting

Following troubleshooting instructions in the Operating Manual.

IV. Collection of Data Including Operating Procedures

A. Safety note: General safety precautions related to electrical hazards must be observed at all times when working with electrical equipment. Electrical receptacles and equipment must be properly grounded. Use caution when servicing or operating electrical equipment in wet conditions, as frequently encountered at field monitoring sites. Electrical equipment should be switched off and disconnected prior to servicing of internal parts.

B. Principle and Applicability: This method employs a gravimetric principle. Ambient air is drawn through a $PM_{10}/PM_{2.5}$ inlet at a constant flow rate, continuously weighing a glass filter element upon which the particulate matter is deposited. Mass concentrations are calculated at ten (10) minute intervals, and the instrument is capable of providing not only total mass accumulation, but also 30-minute, 1-hour, 8-hour, and 24-hour averages of the mass concentration. The use of a hydrophobic filter element (i.e., Teflon-coated borosilicate glass) together with warming of the airstream to 50 degrees C, eliminates the necessity for humidity equilibration. Data retrieval is accomplished by periodically downloading from a digital data logging device to a portable computer.

C. Installation and Assembly

1. Place the sensor unit on a sturdy bench in an R & P shelter or indoors, maintaining an ambient temperature between 50 and 86 degrees F.

2. The sample line extends vertically up from the sensor unit through the roof to the $PM10/PM_{2.5}$ inlet which is mounted on a tripod on the roof.

3. The control unit is located indoors with the sensor unit.

4. Assemble the instrument following the instructions given in Section 2.3 (Assembling the Series 1400 Monitor) of the Operating Manual.

5. Follow the instructions in Section 2.4 (Installing the Flow Splitter and $PM_{10}/PM_{2.5}$ Inlet) of the Operating Manual.

6. When transporting the sensor unit, follow the instructions in Section 2.5 (Transporting and Shipping the Sensor Unit) of the Operating Manual.

5. Connect the monitor directly to the data logger if available.

D. Sample Filter Installation and Exchange

1. Follow the instructions in Section 3 (Sample Filter Installation and Exchange) of the Operating Manual.

2. Do NOT handle new filter cartridges with fingers. Use the filter exchange tool provided with the instrument.

3. Keep sample pump running during the filter exchange.

4. Open sensor unit door. Complete the filter exchange as rapidly as possible to minimize temperature fluctuation.

5. Open the filter holding mechanism.

6. Filter removal

   a. Carefully insert the lower fork of the filter exchange tool under the filter cartridge so that the filter disk is between the fork and upper plate of the tool. The tines of the fork should straddle the hub of the filter base.

   b. Gently lift the filter from the tapered element with a straight pull. Never twist or apply sideways force to the tapered element.

7. New filter installation

   a. Place a new filter in the exchange tool so that the filter disk lies between the fork and upper plate of the tool. The hub of the filter should be positioned between the tines of the lower fork. Do NOT touch the filter with your fingers - use the tool.

   b. Hold the exchange tool in line with the tapered element, and gently insert the hub of the filter onto the tip of the tapered element. Ensure that the filter is seated properly, and then apply a downward pressure of approximately one-half (0.5) Kg to set it in place.

   c. Remove the filter exchange tool by retracting it sideways until it clears the filter.

8. Close the mass transducer. Allow the springs to pull it closed for the last centimeter until metal-to-metal contact is audible. DO NOT ALLOW THE

MASS TRANSDUCER TO SLAM SHUT FROM THE FULL OPEN POSITION.

9. Close and latch sensor unit door.

10. Wait five (5) minutes, and open the sensor unit and mass transducer again. Press straight down on the filter cartridge with the bottom of the exchange tool. This ensures proper seating of the filter cartridge after it has experienced an increase in temperature. Close the mass transducer and the sensor unit door.

11. Reset the instrument by pressing <F1> or <RUN> on the control unit keypad.

E. System Operation and Data Storage

1. Follow the instructions in Section 4 (System Operation and Data Storage) of the Operation Manual.

2. To turn the instrument on:

   a. Supply power at the appropriate voltage.

   b. Press the POWER button on the front panel of the Control Unit. A screen appears on the four-line display showing the name of the instrument. Soon after, the main screen will appear.

   c. Turn on the pump to initiate air flow through the system.

3. Determine the average temperature (only if required by the Operating Manual).

   a. Using the nearest National Weather Service Station (NWSS), determine the average temperature for the following periods: Dec-Feb, Mar-May, Jun-Aug, and Sep-Nov.

   b. On or about Dec 1, set the average temperature to the Dec-Feb average.

   c. On or about Mar 1, set the average temperature to the Mar-May average.

d. On or about Jun 1, set the average temperature to the Jun-Aug average.

e. On or about Sep 1, set the average temperature to the Sep-Nov average.

4. Determine the average pressure (only if required by Operating Manual).

a. Using the nearest NWSS, determine the annual average station barometric pressure (PN) in inches of Mercury (Hg).

b. Determine the elevation of the NWSS (EN) and the elevation of the site (ES) in feet.

c. Calculate the average pressure in atmospheres at the site (PS):

$$PS = (PN + ((EN-ES)/1000)) / 29.92$$

5. On those monitors that require it, enter average temperature and pressure as described in the Operating Manual.

6. To turn the instrument off:

a. Press the POWER button on the front panel of the Control Unit. The four-line display will become blank.

b. Turn off the vacuum pump to terminate air flow.

c. Disconnect the instrument from its power supply.

7. As an option, the unit may be operated using an IBM AT-compatible personal computer. If desired, follow the instructions in Section 11 (Viewing Operations with a Computer) of the Operating Manual.

F. Analog Outputs

Set the analog outputs according to Section 5 (Analog Inputs and Outputs) of the Operating Manual.

G. Downloading Stored Data to a Computer (not required if data logger and modem are used)

1. Connecting to a Computer

a. Connect an IBM AT-compatible computer to an RS-232 port using the 9-to-9 pin computer cable provided with the instrument. If the computer has a 25 pin RS-232 port, use the 9-to-9 pin computer cable in combination with the 9-to-25 pin computer adapter provided with the monitor. Be sure that the unused RS-232 port on the instrument is not attached to any cable or device.

b. Execute a communications program (e.g., TEOMCOMM; see section 6.5 of the operation manual) to prepare for the download.

c. Ensure that the communications software is set for the same communication parameters as the instrument. The default settings of the monitor are: 9600 baud, 8 bit word length, 1 stop bit, and NO parity. See Appendix C.2 if it is suspected that these instrument parameters have been changed.

d. Set the communications software to the appropriate mode (e.g., "Data Capture").

e. Change the RS-232 mode on the control unit to the desired setting using the "Set RS-232 Mode" screen.

i. If using a two-way RS-232 protocol, enter the appropriate parameters in the "Com 2-way Settings" screen.

ii. If using the TEOMCOMM software, select the "AK Protocol" from the "Set RS-232 Mode" screen, and enter the following values on the four lines of the "Com 2-way Settings" screen:

RS-Para 1	52
RS-Para 2	75048
RS-Para 3	13010
RS-Para 4	0

f. Test the connection by checking that the data can be sent and retrieved using the commands appropriate to the selected RS-232 protocol.

2. Downloading Stored Data to the RS-232 Port

a. Follow the steps in Section 6.3 (Downloading Storage to the RS-232 Port) of the Operating Manual.

b. Connect an appropriate personal computer to the RS-232 port.

c. Select the "Fast Store Out" mode from the "RS-232 Mode" screen. The internal logger begins to transmit data via the RS-232 port IMMEDIATELY once the mode is chosen; to capture all desired data, it is thus important to connect the computer PRIOR to selecting the "Fast Store Out" mode.

d. The monitor will transmit all stored data from the present location of the storage-to-print pointer (usually where the last download left off) through the last value stored in the internal data logger.

e. When the end of the storage buffer is reached, return the instrument to a different RS-232 mode (e.g., "None" mode) to locate the storage-to-print pointer just after the last data record transmitted. This ensures that the next download will begin where the previous one left off.

f. The location of the storage-to-print pointer can be set manually. This can be accomplished from any RS-232 mode by bringing the "View Storage" screen onto the four- line display (press <Store>). Use the navigational keys to display the record at which the pointer should reside, and then press <Ctrl><Last/First> to locate the pointer just before this record.

3. The instrument also has the capability for connection via a modem as described in section 6.2.2 of the operation manual (Connecting to a Computer Through a Modem).

H. <u>Maintenance</u>

1. The routine maintenence procedures for the instrument are summarized below:

	Procedure	Interval
a.	Clean $PM_{10}/PM_{2.5}$ inlet	Each TEOM filter change
b.	Replace fine particulate filters	6 months or when loaded
c.	Change sample flow in-line filte	6 months

d. Change by-pass flow in-line filter 6 months

e. Clean air inlet system 6 months

f. Leak test 1 year

2. Follow the instructions in Section 7 (Periodic Maintenance) of the Operating Manual.

3. Keep a written record of these maintenance actions.

V. Quality Control Sampling

A. Audits

1. Perform the mass transducer calibration verification every 12 months. Follow either one of the procedures Section 8.5 (Mass Transducer Calibration Verification) of the Operating Manual.

2. Perform the flow audit procedure every 12 months. Follow the instructions in Section 8.6 (Flow Audit Procedure) of the Operating Manual. As part of this audit, perform the leak check as described in Section 8.6.

B. Precision Check (Flow)

Perform option 1 or 2 below:

Option I: Perform a one point flow rate check once every two weeks at the normal flow of the monitor. Use an external flow standard as the known flow and the monitor flow meter as the monitor reading.

Option II: Initially, perform Option I until results are within 4% three times in a row. After that, perform the PC without an external standard. In these PC, the set-point flow is the known flow and the monitor flow meter is the monitor reading. Once every six months, perform the PC with an external standard. If this result is within 4%, do the PC for six months without an external standard. If this result is not within 4%, perform Option I until results are within 4% three times in a row, after that perform the PC without an external standard for six months.

VI. Preparation and Analyzing Samples in the Field

See paragraph IV above.

VII. Transport, Transferring, and Storing Samples

See paragraph IV above.

VIII. Data Acquisition and Processing

Usually data is acquired using a data logger and modem. This procedure is described in section 1 and 3 (above) of this document AAM SOP. When a data logger and modem are not available, paragraph IV.G above are followed to download data. These data are brought to the office. The BQAR runs a Quick Basic program on these data in order to copy them to the hourly data base. Data processing procedures are described in section 4 (above) of this document AAM SOP.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

A. TEOM Continuous $PM_{10}/PM_{2.5}$ Monitor

B. TEOM Teflon-coated glass filter cartridges

C. Filter cartridge exchange tool

D. Portable computer system for data retrieval if needed

E. Tool kit

Section 17

LOCAL HEALTH DEPARTMENT SITE AUDIT

I. Overview

Local Health Departments (LHDs) which conduct ambient air quality monitoring activities under Memoranda of Agreement (MOAs) with the Kansas Department of Health and Environment are evaluated to verify that the terms of their respective MOAs and annual workplans are being fulfilled. Periodic physical inspection of HiVol samplers is conducted in order to verify that proper maintenance is being performed and that the samplers are in acceptable operating condition. Continuous monitors are checked to ensure that they are powered up and recording data. Additional physical inspection of monitoring equipment will also be conducted in the event that Air Monitoring Services Section (AMSS) field personnel note evidence of poor maintenance or neglect of equipment located at any monitoring site.

With prior notification, each local health department which participates in ambient air quality monitoring activities under an MOA with KDHE is visited by AMSS personnel. It is preferable that the AMSS send one (1) QA/QC person and one (1) field technician as an audit team. Files are checked for consistent documentation of quality assurance. Equipment maintained by the LHD is inspected *in situ*, preferably in the company of appropriate LHD personnel, to verify that it is being maintained in safe and acceptable operating condition. Any immediately evident problems are discussed with the LHD personnel as they are noted. A summary of the findings and any recommendations for corrective action are included in a report. A copy of the report is provided to the appropriate LHD personnel.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

This not applicable.

IV. Collection of Data Including Operating Procedures

A. Site Audit Procedure

1. Notification

a. Contact the appropriate LHD personnel by telephone or in person and establish a tentative date for the site audit.

b. Follow up by mail with a written notification to the appropriate LHD supervisor.

i. If possible, provide at least two weeks notice.

ii. State that a site audit has been tentatively scheduled for the date negotiated.

iii. Enclose a copy of the "Air Quality Monitoring Checklist for Workplan/MOA Audit of Local Health Agencies" to facilitate preparation for the audit. (See Appendix C below.)

2. LHD Records Audit

a. Upon arrival at the LHD office on the day of the audit, obtain a copy of the completed checklist.

b. Use the checklist in conjunction with the "Site/Systems Inspection and Audit Checklist" for review of QA records. (See Sec. E. below.)

i. If the LHD is responsible for calibrations, verify that complete and up-to-date calibration information is on file. Recommend development of a written calibration schedule if not in use.

ii. If the LHD is responsible for performance audits, verify that complete and up-to-date audit information is on file. Recommend development of a written audit schedule if not in use.

iii. If the LHD is responsible for calibrations and/or performance audits, verify that a complete and up-to-date list of all standards and equipment used for such purposes, together with copies of manufacturers' certifications for permeation tubes and cylinders of compressed gases is on file.

iv. Verify that complete and up-to-date maintenance information is on file. Recommend development of a written preventive maintenance schedule if not in use.

3. Physical inspection of Monitoring Equipment

Note: This inspection may also be performed on **any** equipment in the Kansas Ambient Air Monitoring Network. It may be performed independent of an LHD site audit.

a. Purpose

i. Periodic physical inspection of HiVol samplers is conducted in order to verify that proper maintenance is being performed and that the samplers are in acceptable operating condition. Condition of wiring is evaluated to ensure operator safety and minimize instrument down time.

ii. Continuous monitors are checked to ensure that they are powered up and recording data.

b. HiVol Sampler Site Audit

i. If possible, have at least one (1) LHD employee directly involved in sampler operation accompany the AMSS inspector(s) to the site(s) selected for equipment inspection.

ii. Conduct the inspection of equipment using the "HiVol (TSP/PM_{10}) Maintenance and Operational Checklist". Use a separate checklist form for each sampler. (See Sec. E. below.)

iii. For a PM_{10} sampler, check all hood latches for general condition, proper adjustment, and verify that all are properly engaged.

iv. For a PM_{10} sampler, inspect the shim (impaction plate) to verify that it is reasonably clean and properly lubricated.

v. For a PM_{10} sampler, inspect all gaskets (above and below shim) and note their condition. Look for evidence of leakage (e.g., "dust trails", etc.).

vi. Check the filter element cassette gasket and note its condition.

vii. Start the motor and check for even speed after a warm-up period.

viii. Inspect electrical supply lines and visible internal wiring and connections. Note their condition.

c. Continuous Monitor Site Audit

Note: Proper operation of continuous monitors is verified primarily by means of precision and span check procedures.

i. Verify that continuous monitor(s) are switched on.

ii. Verify that data are being recorded.

iii. Verify that the recording device is registering data at the proper times.

4. Summary Report of Findings

a. Review all checklist forms completed during the LHD site audit.

b. Prepare a brief summary of findings.

c. Include recommendations for corrective action(s).

d. Provide copies of the report to the Section Chief of Air and Asbestos Compliance and the appropriate LHD personnel. A copy will also be kept in an AMSS file.

B. Forms Used in Conducting Local Health Department Site Audits

The forms utilized in the course of local health department site audits appear in Appendix C below.

V. Quality Control Sampling

This is not applicable.

VI. Preparation and Analyzing Samples in the Field

This is not applicable.

VII. Transport, Transferring, and Storing Samples

This is not applicable.

VIII. Data Acquisition and Processing

Paper or electronic report is sent to local health agency and also a copy is filed in the AMSS.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

No equipment other than equipment which is inspected.

Section 18

CALIBRATION OF AUXILIARY FLOW METERS

I. Overview

This section describes the procedures for calibrating auxiliary flow meters which exist on various monitoring equipment. These flow meters are not used directly in measuring air pollutant concentration. An example of this type of flow meter is a Metronics Calibrator rotameter.

II. Technical Qualifications

All personnel involved are required to have the necessary experience and training to perform this monitoring activity correctly.

III. Calibration and Troubleshooting

A. Calibration of Rotameter

1. Purpose

This procedure describes the calibration of a Metronics Calibrator rotameter using a Dry Cal DC-2 Flow Calibrator (BIOS) manufactured by BIOS International Company.

2. Procedure

a. Following the operator's manual of the Metronics Calibrator and the BIOS, assemble a BIOS in line with the rotameter, needle valve, and pump.

b. Turn on the pump.

c. Adjust the needle valve until the rotameter indicator is about 20 percent of full scale.

d. Following the BIOS operator's manual, measure the flow (standard conditions) using the BIOS. Record the rotameter reading and the BIOS flow reading.

e. Repeat the two steps immediately above for approximately 40, 60, 80, and 100 percent full scale of the rotameter.

f. Using Quattro Pro software, run a regression with the rotameter readings as the first independent variable, the rotameter readings squared as the second independent variable, and the BIOS readings as the dependent variable. The resulting second degree curve will be the calibration curve. In Quattro Pro, print a table with the rotameter setting by 0.5 increments and the corresponding standard flow from the calibration curve.

3. Equipment

Rotameter, BIOS flow calibrator, needle valve, and pump.

4. Use of Other Standards

The BIOS is a primary standard. Rotameters may also be calibrated against secondary standards such as wet test meters, dry gas meters, mass flow meters, and laminar flow elements, provided these secondary standards have been calibrated against a primary standard. The method of choice will vary, depending on the rate of flow to be measured; and/or the scale or limits of the calibration standard. The choice of method should be made by a qualified technician trained in the use of these methods of calibration.

B. Calibration of a Mass-flow Meter

1. Purpose

This procedure describes the calibration of a Mass-flow Meter using a Dry Cal DC-2 Flow Calibrator (BIOS) manufactured by BIOS International Company.

2. Procedure

a. Following the operator's manual of the Mass-flow Meter and the BIOS, assemble a BIOS in line with the Mass-flow Meter, needle valve, and pump.

b. Turn on the pump.

c. Adjust the needle valve until the Mass-flow Meter indicator is approximately 20 percent of full scale.

d. Following the BIOS operator's manual, measure the flow (standard conditions) using the BIOS. Record the Mass-flow Meter reading and the BIOS flow reading.

e. Repeat the two steps immediately above for approximately 40, 60, 80, and 100 percent full scale of the Mass-flow Meter.

f. Using Quattro Pro software, run a regression with the Mass-flow Meter readings as the first independent variable, the Mass-flow Meter readings squared as the second independent variable, and the BIOS readings as the dependent variable. The resulting second degree curve will be the calibration curve. In Quattro Pro, print a table with the Mass-flow Meter setting by 0.5 increments and the corresponding standard flow from the calibration curve.

3. Equipment

Mass-flow Meter, BIOS flow calibrator, needle valve, and pump.

C. Perform troubleshooting actions according to the applicable manufacturer's manual.

IV. Collection of Data Including Operating Procedures

This is not applicable because there is no sampling involved. Procedures for calibration are described in paragraph III above.

V. Quality Control Sampling

This is not applicable because there is no sampling involved.

VI. Preparation and Analyzing Samples in the Field

This is not applicable because there is no sampling involved.

VII. Transporting, Transferring, and Storing Samples

Calibrations are documented by recording the date, the person, person's initials, the standard ID, the flow meter ID, the standard flow readings, the flow meter readings, and calibration curve. This documentation is submitted to the Bureau QA Representative for filing.

VIII. Data Acquisition and Processing

Paper records of these calibrations are filed by the Bureau QA Representative.

IX. Glossary of Technical Terms

See the glossary in Appendix A of this document (AAM SOP) and in Appendix A of the KDHE DOE Quality Management Plan (Part I).

X. Checklist of Field Equipment

See paragraphs III.A.3 and III.B.3.

APPENDIX A

GLOSSARY OF TERMS

Absorption -- the process of one substance entering into the inner structure of another.

Activated Charcoal -- a highly absorbent form of carbon used to remove odors and toxic substances from liquids or gases.

Adsorption -- the adhesion of a thin film of liquid or gases to the surface of a solid substance.

Aerometric Information Retrieval System (AIRS) -- a computer-based repository of US air pollution information administered by the EPA Office of Air Quality Planning and Standards.

Air-conditioning -- the process of treating air to meet the requirements of a conditioned space by controlling its temperature, humidity, cleanliness, and distribution.

AIRS (Aerometric Information Retrieval System) -- a computer-based repository of US air pollution information administered by the EPA Office of Air Quality Planning and Standards.

Air -- So called "pure" air is a mixture of gases containing about 78 percent nitrogen; 21 percent oxygen; less than 1 percent of carbon dioxide, argon, and other gases; and varying amounts of water vapor. See also ambient air.

Air Monitoring -- Sampling for and measuring of pollutants present in the atmosphere.

Air Pollutants -- Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects to humans, animals, vegetation, and/or materials. (See also air pollution.)

Air Pollution -- Degradation of air quality resulting from unwanted chemicals or other materials occurring in the air. (See also air pollutants.)

Air Quality Index (AQI) -- A numerical index used for reporting severity of air pollution levels to the public. It replaces the formerly used Pollutant Standards Index (PSI). Like the PSI, the AQI incorporates five criteria pollutants (ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide) into a single index. The new index also incorporates the 8-hour ozone standard and the 24-hour PM2.5 standard into the index calculation. AQI levels range from 0 (good air quality) to 500 (hazardous air quality). The higher the index, the higher the level of pollutants and the greater the likelihood of health effects. The AQI incorporates an additional index category, unhealthy for sensitive groups, that ranges from 101 to 150.

Ambient Air -- The air occurring at a particular time and place outside of structures. Often used interchangeably with "outdoor air." (See also air.)

Ammonia (NH3) -- A pungent colorless gaseous compound of nitrogen and hydrogen that is very soluble in water and can easily be condensed into a liquid by cold and pressure. Ammonia reacts with NOx to form ammonium nitrate, a major PM2.5 component in the Western United States.

Area Sources -- Those sources for which a methodology is used to estimate emissions. This can include area-wide, mobile and natural sources, and also groups of stationary sources (such as dry cleaners and gas stations). The federal air toxics program defines a source that emits less than 10 tons per year of a single hazardous air pollutant (HAP) or 25 tons per year of all HAPs as an area source.

Atmosphere -- 1. The gaseous mass or envelope of air surrounding the Earth. From ground-level up, the atmosphere is further subdivided into the troposphere, stratosphere, mesosphere, and the thermosphere. 2. A standard unit of pressure exerted by a 29.92 inches (760 mm) column of mercury at sea level and equal to 1000 grams per square centimeter.

Barometric pressure -- The pressure from the atmosphere without any correction to sea level.

Carbon Dioxide (CO2) -- A colorless, odorless gas that occurs naturally in the Earth's atmosphere. Significant quantities are also emitted into the air by fossil fuel combustion.

Carbon Monoxide (CO) -- A colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. Over 80% of the CO emitted in urban areas is contributed by motor vehicles. CO is a criteria air pollutant.

Channel -- A monitored analog input line on a data logger, normally associated with data from one sensor or instrument.

Cubic feet per minute (CFM) -- The amount of air, in cubic feet, that flows through a given space in one minute.

Concatenate -- to link computer files together in a series or chain**.**

Continuous Sampling Device -- An air analyzer that measures air quality components continuously.

Concentration -- The quantity of one constituent dispersed in a defined amount of another.

Criteria air pollutant -- An air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set. Examples include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM10 and PM2.5. The term "criteria air pollutants" derives from the requirement that the U.S. EPA must describe the characteristics and potential health and welfare effects of these pollutants. The U.S. EPA periodically review new scientific data and may propose revisions to the standards as a result.

Data logger -- The data acquisition and control device that collects data from air monitoring instruments (sensors), averages it, stores it temporarily, and passes it to the office computer on request.

Desiccant -- A chemical agent that absorbs moisture.

Dilution -- A concentration made less concentrated by adding gas or liquid.

Downloading -- The process of transferring configuration information from the office computer to the data loggers.

Dust -- Solid particulate matter that can become airborne.

Emission -- Pollution discharge from a source.

Exceedance -- A measured level of an air pollutant higher than the national ambient air quality standards. (See also NAAQS.)

Exposure -- The concentration of the pollutant in the air multiplied by the population exposed to that concentration over a specified time period.

Exposure Assessment -- Measurement or estimation of the magnitude, frequency, duration and route of exposure to a substance for the populations of interest.

Fly Ash -- Air-borne solid particles that result from the burning of coal and other solid fuel.

Gas -- A state of matter in which substances exist in the form of nonaggregated molecules, and which, within acceptable limits of accuracy, satisfies the ideal gas laws.

Gravimetric -- of or relating to measurement by weight**.**

Haze (Hazy) -- A phenomenon that results in reduced visibility due to the scattering of light caused by aerosols. Haze is caused in large part by man-made air pollutants.

High efficiency particulate arrestance (HEPA) -- High efficiency air filter.

Hydrocarbons -- Compounds containing various combinations of hydrogen and carbon atoms. They may be emitted into the air by natural sources (e.g., trees) and as a result of fossil and vegetative fuel combustion, fuel volatilization, and solvent use. Hydrocarbons are a major contributor to smog.

Humidity -- The measure of moisture in the atmosphere.

Hydrogen Sulfide (H2S) -- A colorless, flammable, poisonous compound having a characteristic rotten-egg odor. It is used in industrial processes and may be emitted into the air.

Inert Gas -- A gas that does not react with the substances coming in contact with it.

Inversion -- A layer of warm air in the atmosphere that prevents the rise of cooling air and traps pollutants beneath it.

Mean -- Average.

Median -- The middle value in a population distribution, above and below which lie an equal number of individual values; midpoint.

Micron -- A unit of linear measure equal to one millionth of a meter, or one thousandth of a millimeter.

Monitoring -- The periodic (intermiitent) or continuous sampling and analysis of air pollutants in ambient air or from individual pollution sources.

NAMS -- National Air Monitoring Station.

National Ambient Air Quality Standards (NAAQS) -- Standards established by the United States EPA that apply for outdoor air throughout the country. There are two types of NAAQS. Primary standards set limits to protect public health and secondary standards set limits to protect public welfare.

Negative Pressure -- Condition that exists when less air is supplied to a space than is exhausted from the space, so the air pressure within that space is less than that in surrounding areas.

NH3 – Ammonia

Nitric Oxide (NO) -- Precursor of ozone, NO2, and nitrate; nitric oxide is usually emitted from combustion processes. Nitric oxide is converted to nitrogen dioxide (NO2) in the atmosphere, and then becomes involved in the photochemical processes and/or particulate formation. (See nitrogen oxides.)

NIST -- National Institute of Standards and Technology.

Nitrogen Oxides (Oxides of Nitrogen, Nox) -- A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO2 is a criteria air pollutant, and may result in numerous adverse health effects.

NOy -- The sum of all oxidized nitrogen species, i.e. NO, NO2, NO3, HNO3, N205, alkyl nitrates, PAN, etc. Does not include NH3 or N2O. See also nitrogen oxides, NOx.

Odor -- A quality of gases, liquids, or particles that stimulates the olfactory organ or sense of smell.

Odor Threshold -- Concentration of odorous air at which it is detected by humans.el detect the odor.

Opacity -- The amount of light obscured by particle pollution in the atmosphere. Opacity is used as an indicator of changes in performance of particulate control systems.

Organic Compounds -- A large group of chemical compounds containing mainly carbon, hydrogen, nitrogen, and oxygen. All living organisms are made up of organic compounds.

Oxidant -- A substance that brings about oxidation in other substances. Oxidizing agents (oxidants) contain atoms that have suffered electron loss. In oxidizing other substances, these atoms gain electrons. Ozone, which is a primary component of smog, is an example of an oxidant.

Oxidation -- The chemical reaction of a substance with oxygen or a reaction in which the atoms in an element lose electrons and its valence is correspondingly increased.

Ozone -- A strong smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy and ozone precursors, such as hydrocarbons and oxides of nitrogen. Ozone exists in the upper atmosphere ozone layer (stratospheric ozone) as well as at the Earth's surface in the troposphere (ozone). Ozone in the troposphere causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Ozone Layer: A layer of ozone in the lower portion of the stratosphere, 12 to 15 miles above the Earth's surface, which helps to filter out harmful ultraviolet rays from the sun. It may be contrasted with the ozone
component of photochemical smog near the Earth's surface which is harmful.

Ozone Precursors -- Chemicals such as non-methane hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog.

PAMS -- Photochemical Assessment Monitoring System

Parameter -- A single, monitored pollutant, meteorological parameter, or other measured entity.

Particulate Matter (PM) -- Any material, except pure water, that exists in the solid or liquid state in the atmosphere. The size of particulate matter can vary from coarse, wind-blown dust particles to fine particle
combustion products.

Photochemical Reaction -- A term referring to chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.

Photolysis -- Chemical decomposition induced by light or other energy.

Plume -- A visible or measurable discharge of a contaminant body from a given point of origin. Can be a visible body of pollution such as smoke coming from a stack or a measured amount such as heat in water coming from a power plant boiler.

PM2.5 -- A criteria air pollutant consisting of tiny particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.

PM10 (Particulate Matter 10) -- A criteria air pollutant consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs where they may be deposited and result in adverse health effects . PM10 also causes visibility reduction.

POC -- Parameter occurrence code (used in AIRS to designate an additional monitor of the same parameter at the same site).

Point Sources -- Specific points of origin where pollutants are emitted into the atmosphere such as factory smokestacks.

Polling -- The collection and storage of data from a field data logger by the central office computer.

Positive Pressure -- Condition that exists when more air is supplied to a space than is exhausted, so the air pressure within that space is greater than that in surrounding areas.

ppb (parts per billion) -- The concentration of a pollutant in air in terms of volume ratio. A concentration of 1 ppb means that for every billion units of air, there is one unit of pollutant present.

ppm (parts per million) -- The concentration of a pollutant in air in terms of volume ratio. A concentration of 1 ppm means that for every million units of air, there is one unit of pollutant present.

Preventive Maintenance -- Regular and systematic inspection, cleaning, and replacement of worn parts, materials, and systems. Preventive maintenance helps to prevent parts, material, and systems failure by ensuring that parts, materials and systems are in good working order.

PTFE -- Polytetrafluoroethylene.

Reentrainment -- The deposition of particulate from the air to the soil where the particulate in the air was originally drawn in and transported by the flow of air from a source.

Relative Humidity -- Amount of water vapor in the air expressed as a percent of the maximum amount of water vapor that the air could hold at the current temperature.

Site -- An identifier for a data logger that may indicates its location.

SIP -- State Implementation Plan

SLAMS -- State/Local Air Monitoring Station

Smog -- A combination of smoke and other particulates,ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds which, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects.

Smoke -- A form of air pollution consisting primarily of particulate matter (i.e., particles released by combustion). Other components of smoke include gaseous air pollutants such as hydrocarbons, oxides of nitrogen, and carbon monoxide. Sources of smoke may include fossil fuel combustion, agricultural burning, and other combustion processes.

Solar radiation -- The power per unit area applied to a horizontal surface due to the sun.

Soot -- Very fine carbon particles that have a black appearance when emitted into the air.

Source -- Any place or object from which air pollutants are released. Sources that are fixed in space are stationary sources and sources that move are mobile sources.

State Implementation Plan (SIP) -- A plan prepared by states and submitted to U.S. EPA describing how each area will attain and maintain national ambient air quality standards. SIPs include the technical foundation for understanding the air quality (e.g. emission inventories and air quality monitoring), control measures and strategies, and enforcement mechanisms.

Stationary Sources -- Non-mobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants.

Stratosphere -- The layer of the Earth's atmosphere above the troposphere and below the mesosphere. It extends between 10 and 30 miles above the Earth's surface and contains the ozone layer in its lower portion. The stratospheric layer mixes relatively slowly; pollutants that enter it may remain for long periods of time.

Sulfates -- (See Sulfur Oxides.)

Sulfur Dioxide (SO2) -- A strong smelling, colorless gas that is formed by the combustion of fossil fuels. Power plants, which may use coal or oil high in sulfur content, can be major sources of SO2. SO2 and other sulfur oxides contribute to the problem of acid deposition. SO2 is a criteria air pollutant.

Sulfur Oxides -- Pungent, colorless gases (sulfates are solids) formed primarily by the combustion of sulfur-containing fossil fuels, especially coal and oil. Considered major air pollutants, sulfur oxides may impact human health and damage vegetation.

Temperature -- degree of hotness or coldness measured on a definite scale.

TEOM -- Tapered Element Oscillating Microbalance, method of measuring PM2.5 or PM10 on a continuous basis.

Topography -- The configuration of a surface, especially the Earth's surface, including its relief and the position of its natural and man-made features.

Total Suspended Particulate (TSP) -- Particles of solid or liquid matter, such as soot, dust, aerosols, fumes, and mist, up to approximately 30 microns in size.

Troposphere -- The layer of the Earth's atmosphere nearest to the surface of the Earth. The troposphere extends outward about 5 miles at the poles and about 10 miles at the equator.

UG/M3 -- Micrograms per cubic meter.

United States Environmental Protection Agency (U.S. EPA) -- The federal agency charged with setting policy and guidelines, and carrying out legal mandates for the protection of national interests in environmental resources.

USGS -- United States Geological Survey.

UV -- Ultraviolet.

Vapor -- The gaseous phase of liquids or solids at atmospheric temperature and pressure.

Vapor Pressure -- The pressure, often expressed in millimeters of mercury (mm Hg) or pounds per square inch (PSI), that is characteristic at any given temperatures of a vapor in equilibrium with its liquid or solid form.

Viscosity -- The degree to which a fluid resists flow under an applied force.

Visibility -- A measurement of the ability to see and identify objects at different distances. Visibility reduction from air pollution is often due to the presence of sulfur and nitrogen oxides, as well as particulate
matter.

VOC -- Volatile Organic Compound.

Volatile -- Any substance that evaporates readily.

Volatile Organic Compounds (VOCs) -- Carbon-containing compounds that evaporate into the air (with a few exceptions). VOCs contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints.

Welfare-Based Standard (Secondary Standard) -- An air quality standard that prevents, reduces, or minimizes injury to agricultural crops and livestock, damage to and the deterioration of property, and hazards to air and ground transportation.

Wind direction (vector average) -- The direction of the resultant vector sum of all wind observations during the hour. The direction indicates where the wind is blowing from.

Wind observation -- A vector with direction being where the wind is blowing from and magnitude equal to the wind speed.

Wind speed (vector average) -- The magnitude of the resultant vector sum of all wind observations during the hour divided by the number of observations.

WINS -- Well impactor ninety-six (the part of the PM2.5 monitor which separates the smaller than or equal 2.5 micron particles from the air).

Appendix B

CHECKLIST FOR INSPECTION AND AUDIT OF CONTRACT LABORATORY FOR MICROGRAVIMETRIC ANALYSIS OF $PM_{2.5}$ FILTER ELEMENTS

Kansas Department of Health and Environment
Bureau of Air and Radiation
CHECKLIST FOR INSPECTION AND AUDIT OF CONTRACT LABORATORY FOR MICROGRAVIMETRIC ANALYSIS OF $PM_{2.5}$ FILTER ELEMENTS

Contractor: ____

Address: ____

____

____

Auditor Name and Affiliation: ____

Audit Question	Yes	No	NA	Comments
Analytical Facility / Weighing Room:				
Is the filter preparation / weighing area neat and clean?				
Is the analytical balance located in the same controlled environment in which filters are conditioned?				
Is weighing area isolated from vibration?				
Are effective methods for neutralization of electrostatic charge employed in the weighing area?				
Is HEPA filtration of the inlet air system employed?				
Is weighing area in an interior location without windows?				
Are the following conditions for filter conditioning / weighing met as specified in 40 CFR Part 50, Appendix L?				

Mean temperature:	20-30^{o}C.
Temperature control:	$\pm$2^{o}C over 24 hours.
Average humidity:	30-40% relative humidity (RH).
Humidity control:	$\pm$5% RH over 24 hours.
Conditioning time:	Not less than 24 hours.

$PM_{2.5}$ Microgravimetric Contractor Audit Checklist (Continued).

Audit Question	Yes	No	NA	Comments
Microgravimetric Balance Performance:				
Does each analytical balance used to weigh filters have an identification number?				
Is each identification number recorded to verify weighings conducted on a specific balance?				
Does each analytical balance used to weigh filters have a readability of $\pm$1ug?				
Does each analytical balance used to weigh filters have a repeatability of $\pm$1ug?				
Was each balance calibrated as specified by the manufacturer at installation?				
Is each balance recalibrated immediately prior to each weighing session?				
Are regular (e.g., daily, when in use) balance calibration checks made and properly recorded?				
Are working mass standards verified against NIST-traceable primary standards at least every 6 months?				
For each balance used to weigh filters, is the weight obtained for a 200mg audit weight within $\pm$50ug?				
Are non-metallic forceps used to handle mass standards?				
Microgravimetric Balance Maintenance:				
Is there a formal logbook for balance maintenance?				
Are the balance maintenance logbook entries current?				
Is the balance on a service agreement for regular professional maintenance, or is someone within the organization certified by the manufacturer to service the balance?				
Filter Conditioning:				
Are filters conditioned immediately prior to both pre- and post-sampling weighings?				

$PM_{2.5}$ Microgravimetric Contractor Audit Checklist (Continued).

Audit Question	Yes	No	NA	Comments
Filter Conditioning (Continued):				
Are filters conditioned at the same environmental conditions prior to both pre- and post-sampling weighings?				
Are new filters immediately placed in the conditioning environment and stored there until the pre-sampling weighing?				
Are filters weighed immediately following the conditioning period without intermediate or transient exposure to other environmental conditions?				
Filter Handling:				
Are powder free gloves used by the analyst?				
Are smooth, clean forceps used by the analyst?				
Are ^{210}Po strips used to neutralize electrostatic charge?				
If so, are ^{210}Po strips replaced every 6 months?				
Are filters visually inspected prior to weighing?				
Are filter numbers properly recorded and legibly written?				
Filter Weighing Procedures:				
Are both the pre- (tare) and post-sampling weighings carried out on the same analytical balance?				
Are both weighings carried out by the same analyst?				
If not, have results from the different analysts been statistically compared?				
Are pre-sampling weighings performed within 30 days prior to exposure of the filters? (Review records for evidence of filters which exceed this time span.)				

$PM_{2.5}$ Microgravimetric Contractor Audit Checklist (Continued).

Audit Question	Yes	No	NA	Comments
Filter Weighing Procedures (Continued):				
If filters are stored at ambient temperature, are the post-sampling conditioning and weighings completed within 10 days (240 hours) after the end of the sample period?				
If not, are the results appropriately flagged?				
If filters are stored at 4ºC or less during the entire time between retrieval from the sampler and start of conditioning, are the post-sampling conditioning and weighings completed within 30 days after the end of the sample period?				
Are new field blank filters weighed along with the pre-sampling weighing of each lot of filters?				
Are field blank filters routinely used, observing the following steps: transport to the sampling site; install in sampler; retrieve from sampler (without sampling); and reweigh?				
Are laboratory blank filters employed to determine filter mass stability?				
Are laboratory blank filters weighed along with the pre-sampling weighing of each set of filters and reweighed when the exposed filters are received from the field? (These laboratory blank filters should remain in the laboratory in protective containers during field sampling, and should be reweighed as a QC check.)				
Is each balance rezeroed after every tenth filter weighing?				
Are reweighings performed after every tenth filter weighing?				
Record Keeping and Calculations:				
Are logbooks kept current and properly filled in?				
Are logs and/or charts of balance room temperature and humidity on file?				
Are records of shipments (incoming and outgoing) maintained?				
Are records of sample filter condition (e.g., temperature) upon arrival at the laboratory kept?				

$PM_{2.5}$ Microgravimetric Contractor Audit Checklist (Continued).

Audit Question	Yes	No	NA	Comments
Record Keeping and Calculations (Continued):				
Are data management files in order?				
Is there evidence that data validation, internal QA review, and complete data reporting have occurred?				
Is the personnel management structure sound?				
Laboratory Quality Assurance Plan:				
Does the laboratory maintain a written QA Plan?				
Is there evidence that laboratory standard operating procedures (SOPs) are employed and strictly followed by all personnel?				
Are the QA Plan and SOPs current?				

Additional Comments:

Signatures:

Inspector:____Date:_______________________________

Laboratory Manager:____Date:_____________________________

Appendix C

Air Quality Monitoring Checklist for Workplan/MOA Audit of Local Health Agencies

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Bureau of Air and Radiation
Air Quality Monitoring Checklist for Workplan/MOA Audit of Local Health Agencies

This listing should be completed prior to inspection, and a copy of this entire form should be provided to the inspector.

I. Calibrations and Performance Audits

A. Calibrations

If responsible for calibrations of monitors, all calibration records for the preceding twelve months should be readily available at time of inspection. Photocopies of calibration records may be requested.

B. Performance Audits

If responsible for performance audits of monitors, all performance audit records for the preceding twelve months should be readily available at time of inspection. Photocopies of performance audit records may be requested.

C. Certification of Standards

If responsible for calibration and/or performance audits of monitors, a current list of all standards and equipment used for such purposes, together with copies of manufacturers' certifications for permeation tubes and cylinders of compressed gases, should be readily available at time of inspection. Photocopies of some of these materials may be requested.

II. Preventive Maintenance

Is a preventive maintenance schedule followed? Are maintenance and repair records kept in a permanent log?

	Site ID	Parameter	PM Schedule (Y/N)	PM Log (Y/N)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

All preventive maintenance and repair documentation for the preceding twelve months should be readily available at time of inspection. Photocopies of some materials may be requested.

III. Stack testing/CEM certification monitoring

Have stack testing (including opacity observations) and/or CEM certification activities been performed during the past year? If so, please have documentation of all such activities conducted during the preceding twelve months available at time of inspection.

IV. Training Events

Please list all training events related to Air Quality Monitoring which department personnel have attended during the preceding twelve months:

	Event	Location	Person Attending	Date
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

V. Physical Inspection of Monitoring Equipment

At least one staff member directly involved with ambient air monitoring activities should be available to accompany inspection personnel for inspection of <u>all</u> monitoring equipment at all monitoring sites.

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Bureau of Air and Radiation
Air Monitoring Services Section

SITE/SYSTEMS INSPECTION AND AUDIT CHECKLIST

AGENCY: ______________________________ DATE: ____________

LOCATION: ____________________________ AUDITOR: _________

CALIBRATION RECORDS	YES	NO
CALIBRATION FORMS ON FILE		
COMPLETE INFORMATION ON FORMS		
CALIBRATIONS CURRENT		
CALIBRATION SCHEDULE ON FILE		

PERFORMANCE AUDIT RECORDS	YES	NO
AUDIT FORMS ON FILE		
COMPLETE INFORMATION ON FORMS		
PERFORMANCE AUDITS CURRENT		

MAINTENANCE RECORDS	YES	NO
MAINTENANCE FORMS ON FILE		
COMPLETE INFORMATION ON FORMS		
MAINTENANCE RECORDS CURRENT		
*PREVENTIVE MAINTENANCE SCHEDULE ON FILE		

* Recommended, but not required.

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Bureau of Air and Radiation
Air Monitoring Services Section

HiVol (TSP/PM_{10}) MAINTENANCE AND OPERATIONAL AUDIT CHECKLIST

SITE No.: ________________________ DATE: _________

LOCATION: ________________________ AUDITOR: ______

SAMPLER I.D.: ____________________

PM10	YES	NO
LATCHES in good working order		
LATCHES adjusted properly		
LATCHES fastened properly		
SHIM clean		
SHIM oiled		

PM10	GOOD	ACCEPTABLE	REPLACE
GASKETS hood/cover			
GASKETS above shim			
GASKETS below shim			

PM10/TSP	GOOD	ACCEPTABLE	REPLACE
GASKET cassette			
MOTOR start-up			
ELECTRIC supply line			
ELECTRIC internal			
SAFETY ladder			

COMMENTS:

Appendix D

FORM FOR TESTING AND ACCEPTANCE CRITERIA OF PM2.5 MONITORS

TESTING AND ACCEPTANCE CRITERIA	Yes	No
1. Check the enclosed packing list. Were all parts listed included in the delivery of the monitor?		
2. Were any of the enclosed parts broken during the shipping of the monitor?		
3. Check the enclosed assembly instructions. Did all parts fit together during assembly of the monitor?		
4. Does the motor turn on when supplied with electrical power?		
5. Using an independent timing mechanism, check to insure the timer operates properly. Check to see if the timer will automatically turn on and off during a set time by setting the timer to start and stop the monitor while the operator is present.		
6. Does the computer boot up and operate properly? Check to see if the computer has working software by performing manual input of information into the computer.		
7. Does the computer download information properly? Check this by manually trying to download information.		
8. Does the internal fan operate properly? Check this by supplying electrical power to the unit and checking if the fan will turn on and off.		
9. Does the temperature sensor operate properly? Check this by taking a temperature reading with the internal fan off and then with the internal fan on and checking to see if the temperature readings change.		
10. Does the filter holder apparatus operate properly? Check this by manually installing a filter into the holder apparatus and checking to see if the filter is sealed into the unit.		
11. Does the casing protect the internal unit from the weather? Check this by visually inspecting the unit's gaskets and seals for holes, leaks, etc. Note: This is a visual inspection only. Do not take apart the unit.		
12. Does the unit support structure keep the unit secure and upright?		
13. When all parts are assembled and operated together, does the unit function properly? Check this by assembling the unit as the instructions dictate, installing a filter, setting the timer, and operating the unit as a normal monitoring period.		

____________________________ (Accept / Reject)
Certifying Official

City/State:_____________ Phone Number:_________________

Appendix E

$PM_{2.5}$ Laboratory Sample Flags

$PM_{2.5}$ Laboratory Sample Flags

Sample Collection Flags

Lab Code	Name	Description
FE	Flow excursion	Flow rate excursion > ± 5% for > 5 minutes
FS	Flow stop	Measured sample flow rate deviated by more than 10% from set point for more than 60 seconds
TD	Temperature difference	Measured temperature of filter exceeded the measured ambient temperature by more than 5°C for more than 30 minutes
CV	Coefficient of variation	Coefficient of variation of flow rate greater than 2%
PI	Power interruption	Power outage of >60 sec. Occurred during sampling
CL	Calibration	Sampler calibration not valid or missing
SP	Sample period	Elapsed sample period differed by more than ±1 hour of programmed period
WD	Wrong day	Sample period does not match the schedule
FQ	Field QA	Field quality assurance requirements not met
EE	Exceptional Event	Sample affected by event (fire. etc.)
FM	Filter media	Filter media other than Teflon membrane used or in some other way does not meet RM specifications
CI	Collection Interval	Sample was not collected from midnight to midnight

Sample Handling and Analysis Flags

Lab Code	Name	Description
HT	Hold time	Gross mass analysis followed exposure by more than 10 days if sample exposed to temperatures >4°C, or 30 days if sample maintained ≤4°C
XT	Expired tare	Sample period followed tare analysis by more than 30 days
ST	Sample temperature	Sample temperature exceeded 25°C after removal from sampler
SR	Sample removal	Sample not removed from sampler within 96 hours of end of sample period
MD	Missing data	Sample collection data missing
LB	Lab blank	Associated lab blank mass change exceeds ±15μg
FB	Field blank	Mass change of field blank associated with sample exceeds ± 30μg
LC	Lab conditions	Lab conditions outside of range during 24 hours prior to analysis (18°C<T<22°C, 35%<RH<45%)
EQ	Equilibration time	Equilibration time <24hrs for exposed samples, $<t_{equil}$ for tares
BC	Balance checks	Working standard balance checks out of specification (±3μg from certified value)

$PM_{2.5}$ Laboratory Sample Flags

Invalid Sample Codes

Lab Code	Name	Description
CN	Contamination	Contamination including observations of insects or other debris
MM	Machine malfunction	Sampler did not operate properly
FD	Filter damage	Sample filter damaged beyond recovery
MD	Missing data	Missing sample collection data
NM	Negative mass	Filter had a negative mass gain
NR	No run	Sampler did not operate, no sample collected
LE	Lab error	Lab error
OE	Operator error	Operator error
LS	Lost sample	Lost sample
VO	Void Sample	Sample voided by operator

Appendix F

SUMMARY OF $PM_{2.5}$ SAMPLER MAINTENANCE ITEMS

SUMMARY OF $PM_{2.5}$ SAMPLER MAINTENANCE ITEMS

Frequency[a]	Maintenance Item[b]
Every five sampling days	1. Service water collector bottle. 2. Clean or change-out impactor well.
Monthly	1. Clean sampler inlet surfaces. 2. Clean impactor housing and impactor jet surfaces. Examine O-rings. 3. Clean interior of sampler case. 4. Check sampler clock accuracy. 5. Check condition of sample transport containers.
Quarterly (every three months)	1. Inspect O-rings of inlet. Remove and lightly coat them with vacuum grease. 2. Clean sampler downtube. 3. Inspect and service water seal gasket where downtube enters sampler case. 4. Remove, inspect, and service O-rings of impactor assembly. 5. Inspect and service vacuum tubing, tube fittings, and other connections to pump and electrical components. 6. Inspect and service cooling air intake and fans.
Other periodic maintenance	1. Rebuild vacuum pump.

[a] Frequency may vary depending on climate, amount of particulate matter in the air, weather, etc.
[b] Remove impactor and filter cassette before servicing any upstream sampler components.

This table appears as Table 9-1. in Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II, Sec.2.12.9.0, USEPA, Environmental Monitoring Systems Laboratory, Research Triangle Park, NC.

Appendix G

REFERENCES

1. 40 CFR 50, Appendix L, Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere

2. Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. I - V, USEPA, Environmental Monitoring Systems Laboratory, Research Triangle Park, NC

3. Operating Manual: Partisol-Plus Model 2025 Sequential Air Sampler, Rupprecht & Pataschnick Co., Inc., 25 Corporate Circle, Albany, NY 12203

4. Service Manual: Partisol-Plus Model 2025 Sequential Air Sampler, Rupprecht & Pataschnick Co., Inc., 25 Corporate Circle, Albany, NY 12203

5. Ambient Air Monitoring Criteria Pollutants Quality Assurance Project Plan, Kansas Department of Health and Environment, Division of Environment, Bureau of Air and Radiation, Air Monitoring Services Section, Topeka, KS

6. Ambient Air Monitoring Standard Operating Procedures, Kansas Department of Health and Environment, Division of Environment, Bureau of Air and Radiation, Air Monitoring Services Section, Topeka, KS

7. Ambient Air Monitoring Non-Criteria Pollutants Quality Assurance Project Plan, Kansas Department of Health and Environment, Division of Environment, Bureau of Air and Radiation, Air Monitoring Services Section, Topeka, KS

8. 40 CFR 58, Ambient Air Quality Surveillance

9. 40 CFR 58, Appendix A, QA Requirements for SLAMS

10. 40 CFR 58, Appendix B, Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Air Monitoring

11. 40 CFR 58, Appendix C, Ambient Air Quality Monitoring Methodology

12. 40 CFR 58, Appendix D, Network Design for State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS)

13. 40 CFR 58, Appendix E, Probe Siting Criteria for Ambient Air Quality Monitoring.

14. ESC Ozone Mapping System User's Manual, May 1998

15. E-DAS Ambient for Windows Reference Manual, Version 5.33a, October 1999